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The modern journal of classic aeroplanes and the history of flying



MOUNTAIN TIGER

The Northrop F-5 in Swiss Air Force service

ISSUE
31





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Editor's Letter

A VERY WARM welcome to our 31st issue, in which we cover a typically broad selection of subjects, from the wildly optimistic attempts of French aeronaut Louis Damblanc to build a very early form of tilt-rotor (pages 44–52), to the story of the epitome of the small, nimble Cold War jet fighter — the Northrop F-5 — in Swiss Air Force service (including some of author Peter Lewis's eye-popping photography of the Tiger over the Alps). Along the way, we also take in Tom Culbert's historical tribute to the intrepid founders of the "Hump" wartime aerial route over the Himalayas (pages 20–29), Lennart Andersson's investigation into top secret inter-war aerial chemical warfare experiments by Germany and the Soviet Union (pages 68–74), and Professor Keith Hayward's political analysis of the *malheureuse* Anglo-French Variable Geometry project *débâcle*, if you'll pardon my French.

We also offer a welcome return to Amaru Tincopa's *Wings Over Peru* series (pages 54–66), in which he traces the career of the Douglas 8A in Peruvian service, incorporating a level of detail that was simply unavailable in English as little as a decade ago. Being able to bring this material to a wider audience, thanks to the sterling efforts of dedicated authors and researchers like Amaru, is a genuine pleasure.

It is of particular poignance to me that this issue includes the first part of an interview I conducted in 2005 with one of Canada's most distinguished airmen — Lt-Col Fern Villeneuve AFC — because we received the sad news that he'd died, aged 92, on Christmas Day 2019. Despite his extraordinary career and remarkable achievements in aviation, Fern was always, by account of everyone who knew him, just "one of the guys" — and I feel privileged to have been able to call him a personal friend.

Finally, before we head into the issue, another reminder that everything we cover in *TAH* — including artworks and book reviews — is included in our index, available (FREE!) as a PDF download from the *TAH* website. Unlock your issues!

FRONT COVER A stunning photograph by PETER LEWIS of a Swiss Air Force F-5E firing off chaff in the twilight over the Alps in late 2016. His article on Switzerland's Tigers begins on page 30.

BACK COVER Revolutionary! A French engineer inspects the sleeve gears of a Bristol Hercules engine. See pages 76–84. VIA UGO VICENZI

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The WW2 aerial supply line between India and China — "The Hump" — has been covered in detail; what has not is the establishment of the treacherous route by four very disparate air transport specialists, half military, half civil, in the spring of 1942. Tom Culbert sets the record straight

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Jean-Christophe Carbonel continues his series on some of France's early aeronautical personalities with the work of Louis Damblanc, inventor of the ingenious but ill-fated Alérion twin-engined rotary-wing aircraft

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Latin American aviation specialist Amaru Tincopa traces the history of the Northrop-designed Douglas 8A in Peruvian service, in which it saw combat in several conflicts

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... Thus Bill Gunston described the ubiquitous Hercules sleeve-valve engine. With the help of his own superb CAD artworks, Ugo Vicenzi describes its development and how the whole pat-head-and-rub-tummy system works

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AIR CORRESPONDENCE



Letters to the Editor

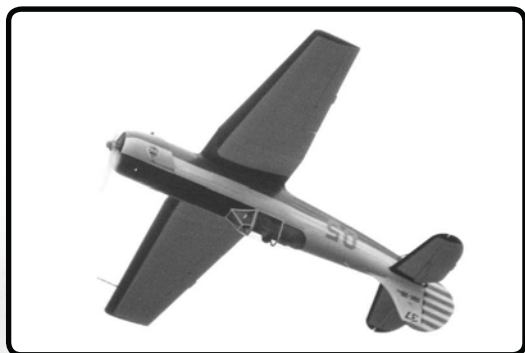
A tale of two Egorovs

SIR — I read Dan Zamansky's Bell P-39 article (*Airacobra: Hero of the Soviet Union, TAH30*) with interest. The reference to the tenth highest-scoring Airacobra ace, one A.A. Egorov, has reminded me of another pilot with the same surname. You will, of course, remember that the World Aerobatic Champion in 1970 was Igor Egorov. It rang a bell with me as I was a line judge at Hullavington when the 1970 championships took place. I don't usually file my photographs with the pilot's name, but the accompanying ones are definitely Igor Egorov, as at the end of the championships he made a winner's demonstration flight on a rather clamped and grey day. Russian safety matters obviously didn't extend to the pilot being obliged to wear a helmet. Before sending you this

message, I googled Egorov and ended up buying a philatelic cover signed by him for £5 off Ebay.

Turning to the Airacobra story, I do think the RAF opinion was also coloured by the fact that they had a lot of accidents and incidents with the aircraft. I researched this years ago in connection with the death of Wal Handley, the famous motorcyclist from Brooklands and elsewhere, who flew in the ATA and was killed in an Airacobra. My notes from RAF Accident Cards indicate that there were nine cases of engine failure and eight of gear problems involving Airacobras, among various other incidents.

Graham Skillen North Cheriton, Somerset
[Dan Zamansky replies: "The Airacobra ace of World War Two was Alexei Alexandrovich Egorov, who was killed in a flying accident on September 25, 1951. The full name of the 1970



ABOVE and BELOW Soviet aerobatic pilot Igor Egorov in helmetless action in his Yakovlev Yak-18 at the end of the World Aerobatic Championships at Hullavington in 1970, photographed by competition judge Graham Skillen (see his letter on these pages). Can anyone tell us if he was related to World War Two Bell P-39 ace Alexei Egorov? ABOVE RIGHT: Igor's autograph on Graham's flown postal cover marking the championships.





A photograph of an unidentified Consolidated B-24 undergoing engine maintenance on the Adriatic island of Vis was featured on the Air Correspondence pages of TAH30, and Liberator specialist Bob Livingstone was quickly able to identify it as B-24J 44-41044 Lady Duzz of the USAAF's 764th Bomb Squadron, 461st Bomb Group. The telltale evidence in that picture included the aircraft's combat number, 18, plus a shapely pair of legs at the very edge of the image. Bob sent us photographs of that same pair of legs, and the young lady to which they belonged, see RIGHT; and of the aircraft's remains — fourth from camera in the view ABOVE of wrecked B-24s and a single Boeing B-17 — in the graveyard at Torretto at the end of World War Two. See his letter headed *Cherchez la femme*.



champion was Igor Nikolaevich Egorov (see a brief sketch of his life on the website of the Russian aerobatics Honour Roll — <http://rus-aerobatics.ru/index.php/honour-roll/86-egorov>). That web page says that Igor was, sadly, killed in another crash, that of a handbuilt aircraft, on October 10, 1981. It had been put together by the 'technical creativity section' of the Progress factory, which has been making space launchers of the famous R-7/Soyuz family since 1958.

"Thank you for sharing your data concerning Airacobra accidents in RAF service. It is most interesting and the issue is worth investigating further. In Soviet service the Airacobra had a reputation for unpleasant spin behaviour, being particularly dangerous in a flat spin. Among the pilots who were unable to recover in time and crashed to their deaths was Lt-Col Konstantin Afanasyevich Gruzdev, a test pilot killed while investigating the type's spin performance on February 9, 1943. Gruzdev was a notable ace of the early months of the German-Soviet war, claiming nine individual and six shared victories while flying the MiG-3 and LaGG-3. Despite such dangers, the P-39 was beloved by Soviet pilots, particularly for Bell's attention to what are now known as 'human factors', including a

cockpit which had both heating and clear glass, rarely found on the Soviet types of the period.

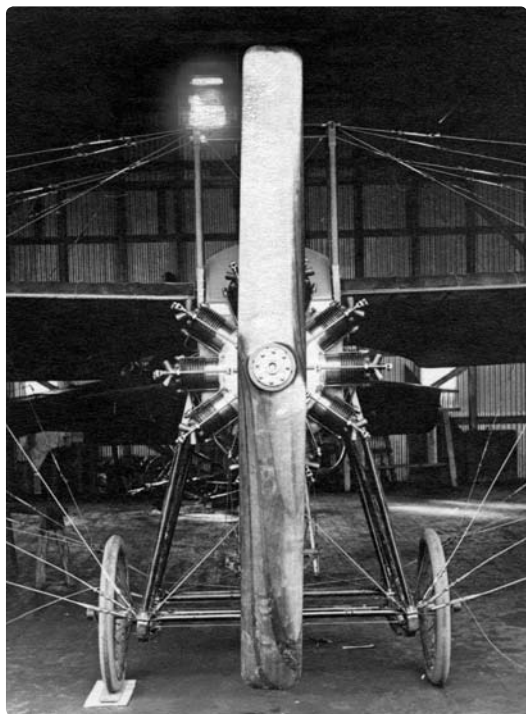
"I have looked at the Airacobra Mk I movement cards at the RAF Museum, and it would be interesting to explore further the service history of this specific model, the only one flown on a substantial scale both by the RAF and the Red Army Air Force. One of the obstacles to such a study is the dense forest of abbreviations used in the movement cards, which even the Museum's helpful staff are sometimes unable to decipher. I would like to appeal to readers with extensive experience of reading these cards to contact me and help clear away some of this fog." [Any offers, please contact me — Ed.]

Cherchez la femme

SIR — The *Vis Revisited* page in TAH30's Air Correspondence includes a photograph of an "unidentified" Consolidated B-24 being serviced.

As soon as I saw the image I said to myself, "461st Bomb Group" — and then the cropped piece of nose-art identified it.

It's B-24J-190-CO 44-41044 *Lady Duzz* of the 764th Bomb Squadron, combat No 18/R. Lt Brown diverted into Vis on Group mission 115



(October 13, 1944) while returning from the Vienna marshalling yards target. The aircraft did not return to the Group until November 6, although the crew would have been returned by C-47 somewhat earlier. *Lady Duzz* was salvaged after a take-off accident on January 23, 1945, and the hulk lingered on in the Torretto graveyard.

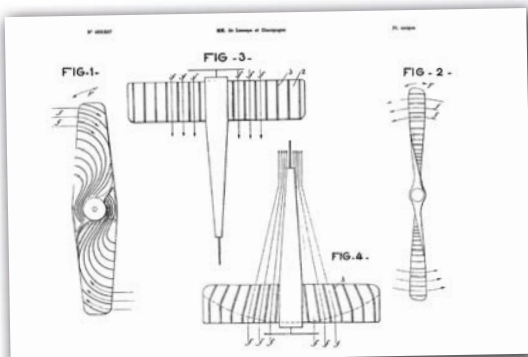
Bob Livingstone Samford, Queensland, Australia

Another Cynos propeller . . .

SIR — As a follow-up to Jean-Christophe Carbonel's article on Antoine Filippi in *TAH30*, I submit a close-up photograph of a Cynos "rotary wing propeller" on a Deperdussin monoplane in the UK in 1912, probably taken at Hendon. I suspect this was not Jules Nardini's aircraft, as his reportedly had a 50 h.p. engine. A pencilled note on the original print says it is Lt Porte's 100 h.p. Dep; the ten-cylinder Anzani radial in the picture is obviously the 100 h.p. unit. Perhaps Porte was trying out the Cynos prop to see whether it improved performance.

In addition, Mr Crawshaw, a pilot flying with the Blériot School at Hendon in 1912, was flying his 50 h.p. Blériot with a Cynos propeller in mid-1912, and a photograph of him with the prop in conspicuous evidence was published on page 21 of *The Aeroplane* for July 4 that year.

Philip Jarrett Dorking, Surrey



LEFT A Cynos "rotary wing" propeller on Lt Porte's Deperdussin — see Philip Jarrett's letter on this page. **ABOVE** Curved grooves on propellers and wings, illustrated in a 1914 patent; see J-C Carbonel's letter.

. . . and those strange grooves

SIR — As a postscript to my *France's Air Pioneers* article on Antoine Filippi in *TAH30*, French Patent 469.857 by De Lesseps explains the curious grooves on the Cynos wing shown on pages 46 and 49. The last paragraph of the patent text says (my translation): "The invention relates to a means to channel and orientate airflow following the desired curve following a surface along which it flows by adding to the surface walls, grooves, fillets, or splines of varying depth. The airflow, through its viscosity, will tend to adopt the form and follow its orientation". I am not sure if this is science or pseudo-science; aerodynamics has many subtleties, not always understood at that time.

Jean-Christophe Carbonel Montreuil, France
[From today's perspective, the idea that such grooves would have any significant benefit seems optimistic . . . unless an aerodynamicist among *TAH's* readership can tell us otherwise? — Ed.]

Metal souvenirs . . .

SIR — Two brief remarks regarding *TAH30*:

1. The P-39 article (*Airacobra: Hero of the Soviet Union*): I have no knowledge of Soviet aircraft markings, but the photo captions on pages 22 and 27, about the *Buffalo Belle* nose-art, reminded me of a picture of a P-39 in service during 1942–44 with the USAAF's 32nd Fighter Squadron at Curaçao and Aruba in the Dutch West Indies. One of the 32nd FS pilots, Captain Roan, was so thrilled with the *Mona* emblem on his P-39 that he transferred the large cowling panel on which it was painted on to the next aircraft assigned to him. The sparsely-clad *Mona* character became famous in the Sixth Air Force and Roan had actually forwarded a spare panel to the NCO artist in Panama who was famous for creating



ABOVE LEFT A proud Capt Roan, USAAF, of the 32nd FS, in front of his personal Bell P-39 Airacobra Mona II. Gerard Casius tells us, in his letter on this page, that Roan took the nose-art panel with him from P-39 to P-39. **ABOVE RIGHT** Former Duxford Airfield deputy director David Lee's rather more readily portable keepsake commemorating ČSA's use of the Tupolev Tu-104A on its international routes — see his letter below.

her. Roan kept swapping the decorated panel from one P-39 to the next. So, this may well also have been the case with the Soviet P-39.

2. The Czech Tu-104A (OK-Jet! *The Tupolev Tu-104A in Czechoslovakia*): When I worked as a service engineer for Beech Aircraft Corp in Wichita, KS, USA, my duties included visiting dealers and customers in Europe, the Middle East and Africa. Organising a four-week travel schedule in these areas without having to sit out the umpteenth weekend layover in wonderful Kinshasa or Jeddah was no easy task and necessitated some personal concessions.

One of them was taking a nightly Tu-104 flight from Cairo to Istanbul, or vice versa. From your article I now realise this was no doubt on ČSA. For an aviation buff this was actually quite an event, of which I just *had* to acquire a souvenir. I decided to unscrew a bilingual Czech/Russian/English "Lifevest under your seat" placard. Apparently I was not the first ČSA passenger with that idea: a stewardess spotted me right away and patrolled the aisle very frequently. I could not manage more than one or two screw turns per "patrol" with my pocket knife (still allowed then; is that why they outlawed them?). Despite a quite unsettlingly low and lengthy orbiting session at night over the destination city, I just could not get the placard off before landing.

Gerard Casius *IJsselmuiden, The Netherlands*

... and paper ones

SIR — I read the article *OK-Jet! The Tupolev Tu-104A in Czechoslovakia* in *TAH30* with interest, as by coincidence I had recently come across a pair of stamps heralding the use of the Tu-104A on international routes. They originate from my youth as a stamp collector — a very long time ago.

David Lee *Wadhurst, East Sussex*

Left right left right

SIR — I am a new subscriber to *TAH* and found the discussion of the proper terminology when discussing port/starboard versus left/right (*Air Correspondence, TAH30*) very interesting. I am an American, but I don't think the reference is any different based on whether you live on the left or right (port or starboard) side of the Atlantic.

I joined the USAF in 1973 and was supposed to go to pilot training. This was during the fuel crisis, and my slot for pilot training disappeared along with the fuel. I trained as a radar intercept controller instead, using ground-based radar to control aerial intercepts and refuelling (GCI Controller). We were told that port and starboard were the only terms we could use. These were used for everything: "Turn port 20°"; "You have unidentified traffic off your port wing, 5 miles". I religiously used these terms for several years.

In 1976 I finally got a chance for pilot training, where we still used port/starboard, but it was also common to hear the terms left and right, especially from controllers at the various regional control centres who directed our cross-country flights. During the next 20 years, I flew the C-141 Starlifter and the T-37 trainer. By the time I retired, the terms left and right had virtually replaced any reference to port/starboard. I can see that historians who deal with aviation may have a different sense of terminology depending on the period they are studying. Following my retirement from the Air Force, I became a college adjunct instructor in history and government. I think this discussion serves to illustrate one of the principles of history: change over time.

George Blair *San Antonio, Texas, USA*

[Yes indeed, history is ever-changing. However, we all know it mostly happened in feet and inches and black-and-white! — Ed.]



AFVG

“A POLITICAL PROBLEM FOR BOTH SIDES...”



THE ANGLO-FRENCH VARIABLE-GEOMETRY PROJECT, 1964–67

Continuing his series on the political background to some of the UK's most challenging post-war aerospace adventures, **PROFESSOR KEITH HAYWARD FRAES** digs deep into the official archives to examine the often-exasperating Anglo-French Variable Geometry project, established in the run-up to the Labour government's cancellation of the TSR.2

WHAT CAME to be known as the Anglo-French Variable Geometry aircraft — AFVG — was the British-led counterpart to the French-led Jaguar, two aircraft that formed a central feature of the Anglo-French military aircraft programme signed in May 1965. [See also *Chris Gibson's What's French for Fait Accompli? in TAH28 — Ed.*] Both were considered important, politically and militarily, but the AFVG was considered the more vital to British interests, and technologically the more advanced of the two projects. While the Jaguar, developed under the SEPECAT ægis, went on to become a successful

operational aircraft, the French unilaterally cancelled the AFVG in June 1967, leaving a large hole in British military aircraft procurement, and threatening the survival of the British Aircraft Corporation's factory at Warton, Lancashire.

A NEW BROOM

In October 1964 the newly elected Labour government inherited an aerospace relationship with the French that had begun in the early 1960s. The incoming administration took over initial talks on a joint strike/trainer aircraft based on a broad set of outline requirements, including a variable-geometry (VG) — or “swing-wing” —

version.¹ Collaboration was consistent with the government's overall cost-saving approach to the industry and potentially advantageous for another attempt to join the European Economic Community (EEC). However, the Treasury was already concerned that economic interests would be secondary to the political, as an October 1964 Treasury memo states:

"We ought to consider very carefully indeed whether the British aircraft industry is in fact capable of taking on another ultra-sophisticated job [beyond Concorde] . . . this is clearly one that has considerable political overtones: this hardly seems a well-chosen moment to decide [on] it."

The Treasury took particular exception to the idea that a training aircraft might require the added complication and expense of a VG wing.²

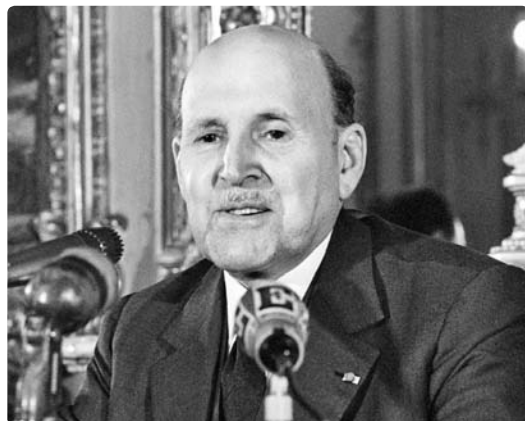
The VG concept dated from work started by British designer Barnes Wallis in 1945, but had failed to get much further than design studies. By the early 1960s, however, VG had begun to gain traction as a way of increasing the flexibility of fast combat aircraft, and BAC wanted to protect its VG competence.³ Again the Treasury saw danger signals, especially as VG began to emerge as an option in discussions with the French:

"For the sake of collaboration with the French we [are] being invited to go ahead with an aircraft which we [do] not want and which we [can] not afford. I judge that the Ministry of Defence [MoD] will spend the next month trying to convince us that there are enough *prima facie* reasons to justify the placing of a study contract."⁴

The Ministry of Aviation (MoA), anticipating the cancellation of BAC's TSR.2 strike aircraft, was certainly keen to launch a new programme to support Warton and to consolidate the Anglo-French partnership: "This appears to offer the best opportunity we have had — or [are] likely to have for some years — to promote Anglo-

French interdependence in the military aircraft field".⁵

The MoA was strongly supported by the MoD, a combination that eventually beat down considerable Treasury opposition to new projects just to maintain design capability within the industry. In February 1965 Secretary of State for Defence

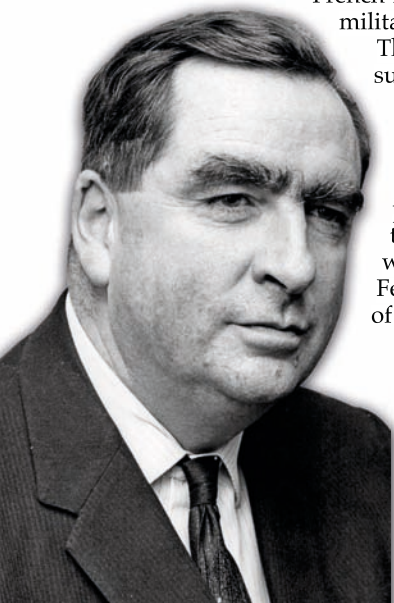


Denis Healey concluded an agreement with the French for a package of military aerospace projects, including a strike/training aircraft, work on guided weapons and helicopters and a further commitment to study a more advanced interceptor/strike aircraft — the AFVG.

Design leadership on the trainer (Jaguar) was awarded to the French manufacturer Breguet, although BAC at Warton was expected to play a significant role in its development. To balance the airframe-leadership position, Britain's Rolls-Royce would lead a joint engine programme with France's Turboméca. The partnership of BAC with Breguet worked well from the outset, as both badly needed the business and had every incentive to pool their efforts in a smooth and efficient manner. The Rolls-Royce/Turboméca partnership would produce the successful Adour engine. In contrast, the industrial leadership positions would be reversed on the AFVG, with BAC leading French manufacturer Dassault.⁶

NEGOTIATIONS BEGIN

Politically, the two sides had very different views about the importance that should be assigned to the AFVG. To the British government, it was a vital project as the "core of our long-term aircraft programme".⁷ However, the French requirement for a new pure strike aircraft was less urgent, and would in the medium term be satisfied by continued developments of Dassault's Mirage family. Equally important, Marcel Dassault was very reluctant to play second fiddle to anyone, and felt that his company "was capable of building a variable-geometry aircraft on its own, and did not need the British".⁸ He could



OPPOSITE PAGE A contemporary model of the AFVG with its wings in the fully swept position. Note the RAF roundels on the port wing and French roundels on the starboard wing. **THIS PAGE, TOP** Marcel Dassault, born Marcel Bloch, one of France's most prolific aircraft designers. Sent to Buchenwald concentration camp during the war for refusing to work with the Germans, he later changed his name. **LEFT** Denis Healey, Secretary of State for Defence during 1964–70.



ABOVE A contract for one two-seat single-engined experimental variable-geometry fighter prototype was awarded to Dassault by the French government on October 13, 1965. It was first publicly shown, as a static exhibit only, at the 1967 Paris Air Salon. The wing sweep had a range from 20° when fully forward to 70° in the fully swept position.

also count on political support from President de Gaulle; as a key British official later noted, Dassault's "successes and wealth have made him a law unto himself".⁹

Dassault had the support of the French procurement agency, *Direction générale de l'armement* (DGA); there was a common interest in maximising sales of Dassault aircraft, and an indigenous French alternative to the AFVG, the single-engined variable-geometry Mirage G, soon appeared as the collaborative negotiations began to stall. The French claimed that this was an "insurance" against UK withdrawal and to fill a gap in the loading of the Dassault design office.

In London, officials downplayed this as a threat to the AFVG: "The French understand our concern at the likely effect on the BAC/Dassault relationship. But they state they have no intention of running a single-engined VG against the twin specified in the [1965 Memorandum of Understanding — MoU]".¹⁰

The British manufacturer was well aware of Dassault's activities, and complained to the MoA. Officials dismissed the company's concerns, but privately they were less sanguine: "It is hard to believe that Dassault, with [his] political power and eye to the main chance, will not exploit and sell this aircraft [Mirage G] if [he] get[s] any chance of doing so profitably. This is essentially a political problem for both sides".¹¹

The relative position of the French and British engine industries was also beginning

to be troublesome. The 1965 MoU specified that France's SNECMA would lead the engine programme, with Bristol Siddeley Engines (BSE) as the UK partner. The joint programme was to be based on a SNECMA design, the M.45G turbofan.¹² While Rolls-Royce was clearly the pre-eminent European aero-engine manufacturer, the French were keen to defend national independence in a key defence technology and improve their capabilities. This had a dual strand; work under licence with the Americans — SNECMA had agreements with Pratt & Whitney (P&W) — and to build on the Concorde engine partnership with the smaller BSE.¹³

The British decision to buy the American General Dynamics F-111 (also a VG design) in 1966 contributed another source of tension. The French *Ministre des Armées*, Pierre Messmer, wrote to Healey arguing that the purchase "would be at variance with the spirit of the Franco-British agreement". Healey countered with another shot at the Mirage G: "I must say frankly that we cannot regard [development of the G] as compatible with whole-hearted co-operation on the joint VG project. As you know, we have no intention of developing a comparable joint national project of our own".¹⁴ The British were also concerned that the French wanted to end the "break clause" in the 1965 MoU. The UK's Minister of Aviation, Frederick Mulley, wrote to the Chancellor, James Callaghan, in late February 1966, that it would be unwise to "give up the break clause in the



ABOVE *Pierre Messmer, France's Ministre des Armées from February 1960 to June 1969. He served as Prime Minister under Pompidou from July 1972 to May 1974.*

Agreement covering this aircraft". The project was a "speculative venture", and it was both "prudent and good management to make some provision for bringing the programme to an end if, in fact, things go wrong". He cited the example of Concorde [see the author's *Concorde: Interdependence Day in TAH27 – Ed.*], which the Labour government had wanted to cancel, but had been blocked by the terms of the 1962 Treaty; a break clause in the AFVG MoU afforded some "leverage over the French".¹⁵

A CHALLENGE FROM ROLLS-ROYCE

In March 1966 the negotiations were further complicated by a pitch from Rolls-Royce to switch engines from the M.45G to its RB.153 turbofan on cost and technical grounds. This may have had some validity, but Rolls-Royce was also playing a wider industrial game, primarily to head off any prospective "Trojan Horse" infiltration from the Americans led by P&W. The same issue was already casting a shadow over the parallel talks to launch the "airbus" airliner [see the author's *Airbus Industrie in TAH28 – Ed.*]. In the AFVG case, Rolls-Royce had the support of the MoD, which recognised the "politico-industrial problems" this presented, but which nevertheless felt that "it would be wrong to allow these to prejudice the prospects for success for what is now our most important military aircraft development project. I hope you will be able to agree that we can make it a primary objective to go for the RB.153".¹⁶

AFVG DATA (AS AT MARCH 1966)



Powerplant 2 x SNECMA M.45G turbojet engines with afterburning

Dimensions

Span		
fully forward	42ft 8in	(13.01m)
swept	23ft 3½in	(7.10m)
Length	53ft 10in	(16.41m)
Wing area		
fully forward	198ft²	(18.4m²)
swept	170ft²	(15.8m²)
Thickness/ chord ratio	12 per cent (forward)	5.7 per cent (swept)

Weights

Loaded	38,107lb	(17,285kg)
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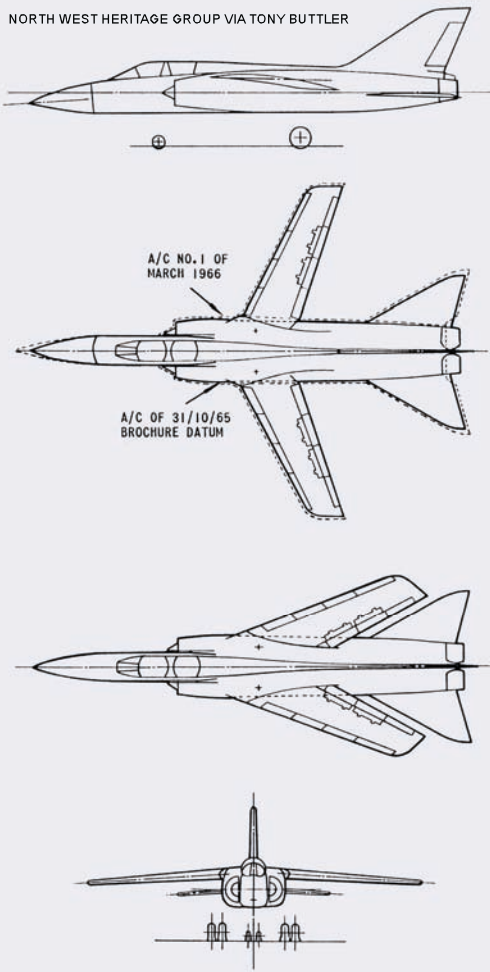
Performance

Maximum speed	
at high altitude	Mach 2.2

Armament 2 x 30mm cannon; 3 x air-to-air missiles; 1 x nuclear weapon; 18 x 1,000lb (454kg) bombs or 2 x Martel anti-radar missiles

Source: *British Secret Projects 2: Jet Bombers Since 1949*, Tony Buttler, Crécy Publishing

NORTH WEST HERITAGE GROUP VIA TONY BUTTLER



Another photograph of the contemporary AFVG model, this time with the wings in the fully forward position. The resemblance to the Dassault Mirage G is striking, although the first prototype of the latter was single-engined, whereas the AFVG was always intended to be fitted with two engines. BAE SYSTEMS



The Rolls-Royce proposal did indeed have some attractions. The M.45G was still only a "paper" engine, whereas the RB.153 was much further along the line. The RAF was also keener on the RB.153, more suited to its strike requirement, feeling that the Air Staff had been "bounced" into the initial choice.¹⁷

The perceived technical advantages of a different engine notwithstanding, the Treasury was alert to the industrial and political implications, domestically and internationally: "It remains to be seen whether a change is practicable in terms of domestic politics and relations with the French". Dropping the M.45G would effectively put BSE out of the large-engine business and create problems with West Germany, which wanted a civil version of the M.45 for its new VFW 614 regional airliner.

Ministry of Aviation officials were well aware of these difficulties, a March 1966 Treasury memo circulated to the MoD and MoA making it clear that if the RB.153 was selected, it would clearly be "impossible" for SNECMA to assume design leadership on the engine, and clarifying that the MoA was only "privately investigating the possibility of using the RB.153".¹⁸

TAKING A TOUGH LINE

However, Healey was advised to take a tough line with his French opposite number. The RB.153 was a cheaper option and better placed in terms of scheduling. Healey was advised to link the change to Rolls-Royce with a shift in design lead on the aircraft, and to get assurances from the French that the Mirage G would not be developed into an operational design in competition with the AFVG. Advice from the MoA stressed the importance of the decision to Rolls-Royce, with BSE working on the Concorde engine and likely

to partner SNECMA on the airbus project and the AFVG. Healey's briefing notes stated that "this leaves virtually nothing for Rolls in the big-engine field in the 1970s, with European leadership in the engine field being shared with the French, who will have built themselves up on UK technology and with UK financial assistance". It continued:

"This situation adds good commercial and political reasons for not choosing the M.45 and adopting the Rolls engine. A large part of the extra cost of the M.45 can be attributed to the French efforts to build up their aero industry, and in this context it can be pointed out to the French that this is no part of our agreement with them, especially at cost to ourselves".¹⁹

A meeting between Healey and Messmer on May 6, 1966, was inconclusive. The French were unimpressed with the savings promised by the RB.153, or by promises from Rolls-Royce to bring SNECMA into the development programme, and stuck firmly to the line that the Mirage G was only a research vehicle.²⁰ Another meeting in July was equally unproductive. SNECMA was still determined to work with the Americans, "even at the expense of links with the British". French officials stated that the company did not have a veto, but they were reluctant to shed the links with P&W until "SNECMA had grown stronger and they were sure it could hold its own in a European partnership".²¹

The British were determined that European collaboration needed a full partnership in all aspects of the industry, which could not be influenced by "outside forces". The French link with P&W, if it impeded co-operation with Rolls-Royce, "must be broken". However, the impending merger of BSE and Rolls-Royce (announced in May 1966) would "precipitate the issue". If SNECMA was to retain its link with



BSE, it could not avoid a link with Rolls-Royce: "The choice between Britain and America will therefore become an immediate one . . . if the French refuse to accept this arrangement it must be explained that the whole future of Anglo-French collaboration is in jeopardy".²²

The French were also beginning to worry about the growing costs of the AFVG, and the air of uncertainty coalescing around the project increased during a meeting between Prime Minister Harold Wilson and President de Gaulle, who said that the French were thinking about a simpler, less expensive interceptor — "something on the lines of the Mirage G. French and British thinking on VG may be becoming incompatible".²³

PATHS DIVERGE

By the autumn of 1966 the two sides were beginning to divide sharply over specifications and timing, reflecting — or caused by — the differences over engine selection. The British were emphasising the AFVG's strike capabilities, but the French were sticking to their original interceptor priority and refused to consider "any arrangement which prevented SNECMA from taking the lead".²⁴

In October Healey told the Cabinet that the MoD was prepared to endorse a request from the MoA to support "our own version" of a VG aircraft if the French abandoned the project. The future of BAC Warton was of paramount importance; it was essential to protect its supersonic experience and the research facilities on site: "our conclusion therefore is that the future military project decisions should be directed towards concentrating combat aircraft design on the BAC team at Warton, and that to preserve the nucleus of the present team it is essential to embark forthwith on a VG aircraft or its equivalent".²⁵

ABOVE *The first Mirage G prototype, powered by a single SNECMA-built Pratt & Whitney TF-306E turbofan, made its maiden flight on November 18, 1967. After an extensive test programme, it was lost in an accident on January 31, 1971. Two examples of a twin-engine version were later developed and flown during 1971–72, but the G project was abandoned.*

At the same time, there were signs that the French were divided over their options, but the rising cost of the AFVG was of increasing concern. Any threat to SNECMA was not going to help: "The engine proposal was effectively SNECMA sub-contracting to Rolls-Royce, [which] held no technical interest for France, and the formula for development work on the engine was quite unacceptable". British officials were increasingly concerned that the UK should not give the "French an excuse to break off talks".²⁶

Tensions between the two aircraft manufacturing partners were now adding to the uncertainties created by differences over the engine. As the head of BAC's military aircraft operation, Freddie Page soon realised that Marcel Dassault and his "head man" on the aircraft side, Benno-Claude Vallières, were firmly in control of company policy in "every detail". Moreover, Marcel Dassault had "tremendous influence in the French government machine at all levels". At a working level, the Dassault and Warton engineers worked "extremely well together and could have formed a superb joint team to lead the world in military aviation, but Dassault pride and ambition would not permit it". From Dassault's perspective, the idea that BAC could lead the programme was "an idea counter to nature".²⁷

Despite BAC's nominal leadership of the AFVG project, Dassault insisted on taking the technical lead. Sir George Edwards, BAC's Chairman, noted how, at a meeting in France, Marcel



“WHEN IT COMES TO IT, SENSIBLE AND PROFESSIONAL ENGINEERS ARE MUCH MORE CONCERNED WITH DEFEATING ISAAC NEWTON THAN WITH DEFEATING EACH OTHER . . .”

— Sir George Edwards, BAC Chairman

LEFT Sir George Edwards was not only a world-class aircraft designer, but also a canny political operator. Nevertheless, even he struggled to establish a satisfactory relationship with the French — and particularly his opposite number in France, Marcel Dassault — in the negotiations between the latter's company and BAC during the AFGV project.

Dassault “immediately repudiated the idea that BAC should lead on the airframe and asked his tame general to check with the [French] defence minister. The general went off to telephone and returned to say that the minister confirmed that there had been no agreement on leadership.” This may have been a bluff, but, on their return to the UK, the BAC team found British officials unable to give a clear lead. Edwards later reported:

“There was a lot of huffing and puffing, but it quickly became clear that, in the turmoil following the TSR.2 cancellation, the deal hastily put together with the French was far from clear, and the UK understanding could or would not be enforced . . . I saw the old man [Dassault] and it became quite clear that he was never going to accept [BAC leadership]. Considering the power he held in France, I read the eventual doom of the AFGV in that one conversation”.²⁸

Despite these hints that all was not well with the pace and direction of negotiations, the British government continued to argue that the Anglo-French package, including the AFGV, was an “essential foundation for the future of the British aircraft industry”.²⁹ Healey told the House of Commons in February 1967 that “without this project there will be no design work for the British aircraft industry, not only in Britain, but in Europe. That is the sense in which this is the core of our long-term aircraft programme”. He was generally upbeat about progress with the French across the board.³⁰

FREXIT!

By April 1967 matters had reached a critical point; a meeting between French and British officials was described as “pretty disastrous, with the French being very French indeed and pressing their own point of view to the utmost [sic]”. This

included promoting Dassault's claims, holding to the M.45G and prioritising the interceptor requirement. The meeting cast a dark cloud over Whitehall. It seemed as if negotiations were deadlocked and the only alternatives were “to accept French proposals, whittle away at the costs and try to get the [West] Germans involved, or decide now to end the project”.

Healey minuted Wilson that there were “some fairly major differences of view between the two sides”, and that the French were only prepared to make minor concessions. Bringing in the West Germans would only delay matters further and they would want a share in the development. Messmer's position looked shaky and he was not sure that the project would go on much longer.³¹

Healey's pessimism was well founded. A ministerial meeting on April 17, 1967, proved to be little better than the earlier official exchanges. Messmer reiterated that domestic budgetary problems were a key issue. The British drew attention to the “uncooperative attitude of Dassault, and could not accept a French lead of both aircraft and engine”.³² Sir Solly Zuckerman, the UK government's Chief Scientist, also warned Wilson in early June that the status of the AFGV was precarious:

“I am told that the President is briefed for ten minutes every day on the state of aircraft projects and was worried about the rising costs of Concorde, and doubted whether the AFGV project should be included in the national programme”. Zuckerman added that at a private meeting with Marcel Dassault, the latter had made “great play of our past failure to co-operate”.³³

Official contacts were increasingly “prolonged and irksome”; cost estimates had again escalated, trust was breaking down and there was no movement on the essential issues of specification



ABOVE The AFVG mock-up at Warton (with a Jaguar fin visible in the adjacent bay). The mock-up was fitted with only one wing, but the general characteristics of the prospective twin-engine strike aircraft are easy to determine. It was vital to preserve BAC's technological capability, which would ultimately bear fruit in the MRCA/Tornado project with West Germany and Italy.

and leadership. French assurances about taking up the Mirage G option had not been helped by the appearance of a prototype at that year's Paris Air Salon.³⁴ Matters were further aggravated by changes at the French defence department, which led to the replacement of largely anglophile officials with more sceptical personnel. Zuckerman's early June warning to Wilson also advised the Prime Minister that he expected that the French were "likely to go ahead with the Dassault prototype as a cheaper option".³⁵

On June 29, 1967, the French government announced that it intended to exercise its rights under the 1965 MoU to withdraw from the AFVG programme on cost grounds.³⁶ President de Gaulle assured Wilson how much he valued Anglo-French aircraft collaboration, and that the French would not order an alternative.³⁷ The BAC team was not so sanguine, however. In its view the French had stalled on the AFVG until the Mirage G was sufficiently advanced to present "a *fait accompli* that the British would have been pressed to buy from France; meanwhile, they had got us firmly locked into the [Jaguar] programme under French leadership".

Unknown to BAC, Dassault was also working on a more conventional concept, the Mirage F1, which would eventually fill the *Armée de l'Air's* interceptor requirement. When BAC eventually did get wind of this, British officials again "seemed to have no knowledge of it".³⁸

AFTERMATH AND BIRTH OF TORNADO

The collapse of the AFVG project was deeply embarrassing to the British government, which was accused of having put all its "aircraft eggs in the collaborative basket". Labour had now spent more than £250m on abortive military programmes — much the same amount as the

maligned Conservative government of the early 1960s. The government — and Healey in particular — were thoroughly discomfited by the whole AFVG affair. It confirmed the view of Sir George Edwards and others, however, that the UK had either to be in a position to lead international ventures or to develop national programmes when the collaborative option was inadequate or questionable.³⁹ To Freddie Page, the turn of events "clearly illustrated the way in which Dassault dominated the French military aircraft business, working closely with government officials for the promotion of exclusively French interests... how different from the British situation!"⁴⁰

Following the collapse of the project, the government continued to support BAC's work on variable geometry, while Healey tried to assemble another international coalition to fill the gap in both BAC's workload and the RAF's requirements. Without such a project, Healey stated in the wake of the French departure, "we must face the fact that the BAC team at Warton will melt away almost immediately. This will remove our capacity to develop airframes for advanced military aircraft. In time, this would call into question how long we would remain able to develop, independently, comparable military engines. We should in fact be faced with a virtual disappearance of the military side of the aircraft industry, with inevitable repercussions on the civil side. This would mean a rapid decline in the industry as a whole with all the conse-



1 Treasury memorandum, October 2, 1964, UK National Archives (TNA) ref T225/2771

2 Ibid

3 The USA's TFX (F-111) and Grumman F-14 would also employ VG. The aim was to improve low-speed performance without sacrificing high speed and manoeuvrability

4 Treasury memorandum, October 9, 1964, op cit

5 Ministry of Aviation (MoA) memorandum, December 29, 1964, TNA T225/2771

6 Anglo-French draft Memorandum of Understanding to study fixed- and VG-wing options, February 1965, TNA T225/2771; see also Freddie Page's diaries, held at the National Aerospace Library, Farnborough, UK

7 Hayward, K., *The British Aircraft Industry*, Manchester University Press, 1989, p111

8 Carlier, C., *Marcel Dassault: la légende d'un siècle*, Librairie Academique Perrin, 1992, p241

9 Memorandum to Prime Minister (PM) Harold Wilson from Sir Solly Zuckerman, June 9, 1967, TNA CAB 164/351. Marcel Dassault also owned several newspapers and was a member of France's *Assemblée nationale*

10 DeVore, M.R., and Weiss, M., "Who's in the Cockpit? The Political Economy of Collaborative Aircraft Decisions", *Review of International Political Economy*, 21:2, pp512–514. See also MoA note *French VG Research Aircraft*, November 10, 1965, TNA AVIA 65/1799

11 Memorandum re letter from Sir George Edwards, February 23, 1966; MoA memorandum, April 15, 1966, TNA AVIA 65/1799

12 Treasury memorandum, March 1966, TNA T225/2650

13 DeVore and Weiss, op cit

14 Letter to Pierre Messmer from Denis Healey, February 15, 1966, TNA T225/2650

15 Correspondence between Minister of Aviation and Chancellor of the Exchequer, February 23, 1966, TNA T225/2650

16 Ministry of Defence (MoD) letter to Sir Richard Way, Permanent Secretary, MoA, March 15, 1966, TNA T225/2650

17 Treasury memorandum to MoD and MoA, *Engine for the VG aircraft*, March 18, 1966, TNA T225/2650

18 Ibid

19 Briefing for Healey's meeting with Messmer about AFVG, May 6, 1966; also MoA appendix on engine choice, TNA T225/2650

20 Record of meeting between French and British defence ministers, May 6, 1966, TNA T225/2650;

also Healey memorandum to PM, May 13, 1966, TNA T225/2651

21 Anglo-French aircraft projects meeting briefing paper, July 1966, TNA T225/2651

22 Ibid

23 Record of meeting between French and British defence ministers, July 27, 1966; also Foreign Office note of meeting between PM and President de Gaulle, July 8, 1966, TNA T225/2651

24 MoD/MoA memorandum, October 7, 1966, TNA T225/2651

25 *The Future of the Airframe Industry*, memorandum to the Cabinet, October 18, 1966, TNA CAB 129/127/1; also memo from Defence Secretary, December 1, 1966, TNA DEFE 13/551

26 Meeting of Anglo-French working group, October 18, 1966; also minutes of ministerial meeting, November 7, 1966; TNA T225/2651

27 Jean Cabrière, a long-term colleague of Marcel Dassault, cited in Carlier, C., op cit, p.241; also Freddie Page's diaries, op cit

28 Gardner, R., *From Bouncing Bombs to Concorde: The Authorised Biography of Aviation Pioneer Sir George Edwards OM*, The History Press, 2006, p137

29 Hayward, K., op cit, p109

30 Ibid, p111

31 Treasury memorandum, April 3, 1967; also minutes of Anglo-French Joint Defence Projects Board, April 7, 1967; memorandum from Denis Healey to PM, April 12, 1967, TNA T225/2858

32 Minutes of ministerial meeting, April 17, 1967, TNA T225/2858

33 Memorandum to PM Harold Wilson from Sir Solly Zuckerman, June 9, 1967, TNA CAB 164/351

34 Ibid

35 Ibid

36 DeVore and Weiss, op cit, p513

37 Report of meeting between PM and French President, June 19, 1967, TNA T225/2944

38 Freddie Page's diaries, op cit

39 Hayward, K., op cit, p111

40 In 1967, encouraged by France's rationalisation of its aircraft industry, Dassault took a majority holding in Breguet with a full take-over in 1971. As the Jaguar competed with the Mirage, BAC felt that Dassault prioritised sales of the exclusively French aircraft. Knowing exactly the Jaguar terms and conditions obviously gave the Dassault sales team a great advantage

41 Memorandum by Secretary of State for Defence and Secretary of State for Technology, June 29, 1967, TNA T225/2944

quent effects on technology and employment"⁴¹

Sir Burke Trend, Cabinet Secretary, was equally despondent: "There is no route on our own; but who is the best partner? The USA is too big for comfort; France too chauvinist for reliability. [West] Germany? Italy? Holland? Too small. I conclude, until we go into the EEC, we should co-operate where we can, putting Germany first".

An alternative set of European partners indeed proved the route to salvation. In December 1968, after a series of protracted negotiations, the UK, West Germany and Italy agreed to launch

a tripartite programme, ultimately to become Panavia. The three air staffs agreed on a joint specification for a Multi-Role Combat Aircraft (MRCA), subsequently to be named Tornado. But combined with the collapse of the AFVG, the emergence of the Tornado group set in train a division in European military aerospace that has continued into the 21st Century.



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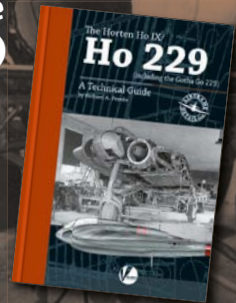
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DINJAN, INDIA



THE HUMP PIONEERS

The RAF, USAAF, Pan Am and CNAC in India, 1942

The deadly wartime work of flying "the Hump" — the vital air resupply route connecting India and China across the Himalayas — is well-known; what is not are the largely improvised operations of the four Allied air transport units that established the route during April–May 1942. **TOM CULBERT** relates how these disparate organisations came together to pioneer the "Aerial Burma Road"

CONFIDENTIAL



P.H.T. GREEN COLLECTION VIA VIC FLINTHAM

IN MOST HISTORIES of the air war during 1939–45, the term “flying the Hump” almost exclusively describes the airlift operations out of India into Burma and China between the summer of 1942 and VJ-Day in August 1945. Missing from these accounts is the unheralded story of the herculean efforts of four pioneering air transport units which worked together in a valiant effort to assist the Allied forces in harm’s way in Burma during April–May 1942.

It was a makeshift combination of the RAF’s No 31 Sqn, the US Army Air Forces’ Assam-Burma-China Ferry Command (ABCFC), the civilian operators of Pan American Airways-Africa Ltd (PAA-Africa) and the China National Aviation Corporation (CNAC), which jumped into the breach to keep vital supply lines open. These four units were able to operate the only real alternative resupply route to Burma and China once the strategically important “Burma Road”, linking Burma with south-west China, was closed by the advancing Japanese. It was the genesis of the “Aerial Burma Road”.

The ability of these four units to operate with little friction stands as a shining example of how allies, both military and civilian, could come together and minimise operational differences, knowing that the mission was paramount. This was in stark contrast to the experiences of PAA-Africa and the RAF just months earlier in Africa.

In late 1941 PAA-Africa was under contract to support RAF aircraft-delivery and air transport requirements in Africa. It was not long before difficulties arose over roles and mission procedures. Operational expediencies caused confusion and friction between military and civilian leaders, and on several occasions British anti-aircraft units accidentally fired on American aircraft. In addition, British commercial airlines

balked at the potential for PAA to benefit from post-war commercial passenger and mail routes in the region.

These problems virtually disappeared in April 1942, however, when the need for Allied air transport capability in the China-Burma-India (CBI) theatre of operations became critical. The RAF, ABCFC, PAA-Africa and CNAC combined their military and civilian airpower expertise to create a true “landmark effort” that was to prove crucial for combat units and civilians facing the advancing Japanese.

The mechanical heroes of this story are the Douglas DC-2 and DC-3/C-47. By January 1942 the USA was fully engaged in the war effort and President Roosevelt was promising that the British, American and Chinese air forces would soon be receiving many more American-built transport aircraft. But by April that year very few had actually reached the CBI front lines. Although the number of DC-3/C-47s available remained limited for months, the type eminently proved itself as an invaluable workhorse in the early days of flight operations over the Hump.

THE POWER OF FOUR

No 31 Sqn, RAF The first and longest-serving British military unit to fly in India, No 31 Sqn Royal Flying Corps arrived in country in 1916 and by early 1942 was stationed at Dum Dum airfield in Calcutta. Wing Commander H.P. Jenkins DFC was the CO during April–May 1942. The squadron flew resupply missions from India to Rangoon (now Yangon), the Burmese capital, until the latter fell to the Japanese in March 1942. By April No 31 Sqn had positioned a detachment of three DC-3s and two DC-2s at RAF Dinjan, located in Assam in north-eastern India, to continue air transport sorties into

OPPOSITE PAGE A map of airfields in the Dinjan region in India, as published in the USAAF’s *Air Route Manual* dated May 25, 1944. **ABOVE** Douglas DC-2 DG471/VT-AOS (c/n 1244) was one of 12 impressed into RAF service with No 31 Sqn in February 1941. It never made it to Dinjan, crashing at Karachi in October 1941. MAP VIA AUTHOR

Delivered into RAF hands by PAA-Africa pilots as "U.S.8" in September 1941, former TWA and Braniff DC-2 AX767/"N" (also formerly G-AGCI in BOAC service) operated with No 31 Sqn in India during April–May 1942. The unit received Battle Honours for its air transport work in Burma during 1941–42.

P.H.T. GREEN COLLECTION VIA VIC FLINTHAM



Burma. Owing to aircraft losses in May, the unit's support missions were subsequently flown by its two remaining serviceable DC-3s. Since there were no longer suitable landing fields in Burma, the resupply missions included air-dropping supplies to soldiers and refugee columns walking into India.

ABCFC, USAAF Meanwhile, pro-China interest groups in Washington DC and London were lobbying high-level political and military staffs to open an aerial resupply route into China. Both Gen Henry H. "Hap" Arnold, Chief of the Army Air Forces, and the RAF's Air Vice-Marshal (Air Marshal from May 1942) Douglas C.S. Evill, head of the RAF delegation in Washington DC, wanted to speed up the movement of additional Douglas transports to India. China had to be resupplied by air so that it could keep up military pressure on the Japanese. As a result, the ABCFC was formed on April 23, 1942, with little foresight and with no published plans or formal lines of communications. Colonel Caleb V. Haynes, assigned as its first commander, who had arrived in India as the head of a bomber unit, initially had four DC-3s under his command at RAF Dinjan.

The initial operational tempo at Dinjan was frenetic, and, with a lack of sufficient support personnel, few records were kept of the unit's activities. The arrival of eight PAA-Africa Douglas transports in April was a major boost to the ABCFC's airlift capability.

PAA-Africa As mentioned, Pan Am subsidiary PAA-Africa had been actively engaged in supporting RAF forces in North Africa since August 1941. Its first "mission-creep" occurred in early 1942 as the USA became a combatant.

Meanwhile, the Allies' campaign in Africa was gearing up as a result of *Generalleutnant* Erwin Rommel's continuing advance across the Western Desert towards Cairo and the Suez Canal.

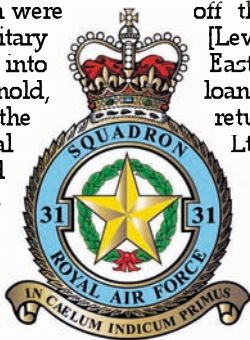
An emergency order for air transport support in India reached PAA-Africa headquarters in Accra, Gold Coast (now Ghana), in late March 1942. The urgent message read:

"You are instructed to move ten DC-type aircraft off the African Run immediately to Gen [Lewis] Brereton [head of the USAAF's Far East Air Force] in New Delhi on temporary loan until project is completed and then return to the African Run. Paul Bird, Jr, 1st Lt, Air Corps, Assistants S-3."

Volunteer civilian crew members were selected and in early April the PAA-Africa Douglas machines and their crews began to depart the Gold Coast for India. The crews thought they were departing on a ten-day mission; it would ultimately last some six weeks. Owing to two *en route* emergency landings in India, only eight of the aircraft arrived in Dinjan on schedule.

Once at Dinjan, the first tasking for PAA-Africa was to transport vital supplies between Karachi and their new home base. The crews completed the missions quickly and were then sent to Dinjan where they were merged into the daily operations of the ABCFC, and began flying missions into China and Burma.

CNAC In 1929 CNAC was formed by the Chinese government. In 1933 PAA acquired 45 per cent ownership of the civilian airline and American William Langhorne Bond was assigned as PAA's representative to CNAC. He resigned from Pan Am in 1937 to be employed directly by CNAC as Operations Manager and Vice-President. In 1941, when meeting the new British Governor of



The workhorse of the four units that pioneered flying “the Hump” from India over the Himalayas to China during April–May 1942 was Douglas’s ubiquitous C-47 transport. A USAAF ABCFC example is seen here at a dispersal site near Dinjan in the Assam province of north-eastern India.



Burma, Sir Reginald Dorman-Smith, Bond was thus introduced by the RAF’s Flt Lt Barnes:

“Governor, this is Mr Bond of the China National Aviation Corporation . . . they are an unusual organisation. They are able, disciplined, and dedicated. We are fortunate to have them out here to work with us.”

By November 1941, having hired American and Chinese civilian pilots working on domestic services in China, CNAC had established a limited cargo operation between India and China, demonstrating its ability to provide resupply support to the Nationalist Chinese government. This operation also enabled CNAC pilots to gain valuable experience flying the Hump.

JAPAN TAKES RANGOON

The port of Rangoon and the Burma Road were vital supply links for the Nationalist Chinese forces under Generalissimo Chiang Kai-shek, as well as the American Volunteer Group (AVG) under the command of Col Claire Chennault. On March 8, 1942, Rangoon fell to the Japanese. Allied forces in Burma — British, Chinese and a small contingent of US Army personnel serving on Gen Joseph “Vinegar Joe” Stilwell’s staff — were now in full retreat. The Burma Road, the only resupply land route to China, was closed.

As the Japanese advanced quickly north through Burma, No 31 Sqn, the ABCFC, PAA-Africa and CNAC responded to the plea for aerial resupply of Allied forces under threat of Japanese attack. The original mission in Dinjan was to establish operations at an austere airfield and to airlift vital supplies the 500 miles (805km) between Dinjan and Kunming in China. To complete this mission these airmen would have to fly over the high Himalayas — the infamous Hump.

Senior USAAF commanders believed that the

route was impossible, owing to the geographical and meteorological conditions that caused severe difficulties for aviators flying over the highest mountains in the world. Only when CNAC senior staff members mentioned that they had been flying the Hump route for some weeks did the US Army begin to plan for flights over the Himalayas.

To their advantage, CNAC pilots had three years of war-zone flying experience by the time the other air transport units arrived in Dinjan. The manager of the CNAC station there was

American civilian pilot Hugh Woods, who, along with his fellow CNAC pilots, was able to share accrued regional flying expertise with the newly arrived Allied aircrews. The company had developed a set of operational directives that had served it well as it continued to fly commercial aircraft in the war zone. On at least two occasions, CNAC provided

Chinese copilots and radio operators for PAA-Africa flights into unsafe areas in China where Japanese fighter aircraft were operating.

Gaining the support of the British colonial authorities in India, including the Director of Air Civil, Sir Frederick Timms, CNAC had the only approved radio beacon ground stations and aircraft equipped with German-built Telefunken radio-navigation systems. The company was justifiably proud of its ability to fly and deliver supplies when other Allied pilots did not have the skills or navigation equipment to fly in such a hostile environment. The other units would often schedule their departures to coincide with a CNAC departure; with limited availability of accurate regional maps, it was much safer to follow the CNAC flight.

Initially there was only one dirt runway at Dinjan, and hard-surface runways were needed to ensure continuous operation during the monsoon





MAP BY MAGGIE NELSON

season. On March 10, 1942, the USAAF's Brig-Gen Earl L. Naiden sent a memo to "Air Marshal, RAF India", regarding the "airdrome requirements for the American Military Air Ferry Service from India to China". The need for fuel, lodging, rail transport provision and facilities for messing were identified and were to be made available by the British forces in India. The upgrade of facilities at Dinjan became a priority.

OPERATIONAL CHALLENGES

The first crews to arrive at Dinjan in April found very austere conditions. The local tea planters in northern Assam were early supporters of the operations, however, and provided lodging and logistical assistance for the new arrivals. Pilots were housed in a *chota bungalow* and the enlisted men in mud *bashas*. The Sealkote Tea Estate, located 18 miles (29km) from the airfield, provided a messing facility for the aircrews, who put up with significant physical and mental hardship while operating out of Dinjan, including ever-present sickness, a lack of sleep owing to long working hours, the mental stress of working in an active war zone and the cumulative effects of flying without adequate oxygen.

One of the first USAAF missions, under the command of Lt-Col William D. Old, launched from Dinjan into China in April 1942, using two PAA-Africa Douglas transports, which ferried 8,000 US gal (30,280lit) of 100-octane aviation fuel intended for use by the returning "Doolittle Raiders" and/or the AVG.

Personnel was a critical issue for the ABCFC. Colonel Haynes was able to augment his limited supply of pilots when four of the survivors of the famous B-25 bombing raid on Tokyo on April

18, 1942, led by Lt-Col James Doolittle, stayed in Dinjan on their way home from China. These pilots pitched in to fly transports and the fighters that Haynes had obtained — two Curtiss P-40s from the AVG and a pair of Republic P-43s from the Republic of China Air Force — thus providing some limited armed-escort capability for air transport missions.

The PAA-Africa aircraft were not well suited for the requirement to fly the Hump. The aircraft had been operating in central Africa and did not have de-icing equipment. The crews had no oxygen, despite the Hump mission requiring flights at altitudes where oxygen was essential. There was no alcohol for keeping the windscreen clear, nor propeller de-icing systems. The aircraft were unarmed except for the use of Thompson sub-machine-guns and M1 Garand rifles, sometimes available to crewmembers to shoot out of the windows if attacked by Japanese aircraft. Furthermore, there were only three aircrew radio operators based at Dinjan. The RAF borrowed one from Cairo on April 1, 1942, for a seven-day round-trip mission to India. He was subsequently commandeered and still at Dinjan in late May.

Maintenance personnel from CNAC were known to pitch in and support the other units when their aircraft needed repairs. Determining who was responsible for costs was often deferred for settlement at a later date. Indeed, CNAC operations at Dinjan began without a contract, as getting the aircraft airborne was deemed to be the most important consideration.

On April 28 PAA-Africa suffered its first — and only — combat-related damage incurred during these operations, when a DC-3 was caught on the ground during a 24-aircraft Japanese bombing



PHOTO PAA VIA AUTHOR

CNAC INSTRUCTIONS FOR PILOTS FLYING IN WAR ZONE

- 1 Get out and keep out of area around Japanese raid until the raid has passed
- 2 As soon as raid is indicated, turn away from it and keep going
- 3 Reduce your altitude as much as you safely can. It is much more difficult to see an aircraft below you than one above you in the open sky
- 4 If there are clouds with no rocks in them, duck into them!
- 5 If you are beyond the target area, that is your safest place. Enemy aircraft will not go far beyond their target looking for you, as that will take them away from their base and will risk their reserve gas
- 6 The worst situation you can experience is to encounter a flight of enemy aircraft returning from a raid, and be in between them and their home base so that they can pursue you in the general direction of their base without endangering their reserve gas too much. The only defense against that is: "DO NOT LET IT HAPPEN!"

Source: *China National Aviation Corporation*, unpublished manuscript by William Langhorne Bond, pp274–275, undated

LEFT One of at least eight DC-2s operated by CNAC being refuelled in typically primitive conditions.



raid on Loi Wing, China. The tailplane was damaged beyond repair, although replacement parts were quickly delivered from Dinjan and the aircraft was repaired and recovered in three days.

THE FALL OF MYITKYINA

Not all of the high-priority cargo and passengers were headed east to China. Vital wartime raw materials including tin and wolfram (tungsten) were transported westerly for the war effort. Flights were often overloaded well beyond the Douglas aircraft's published cargo limit of 2,500lb (1,130kg). Most were loaded with at least 4,000lb (1,810kg) of cargo. There were several flights that carried as much as 7,200lb (3,270kg).

By mid-April the RAF was also using Dinjan

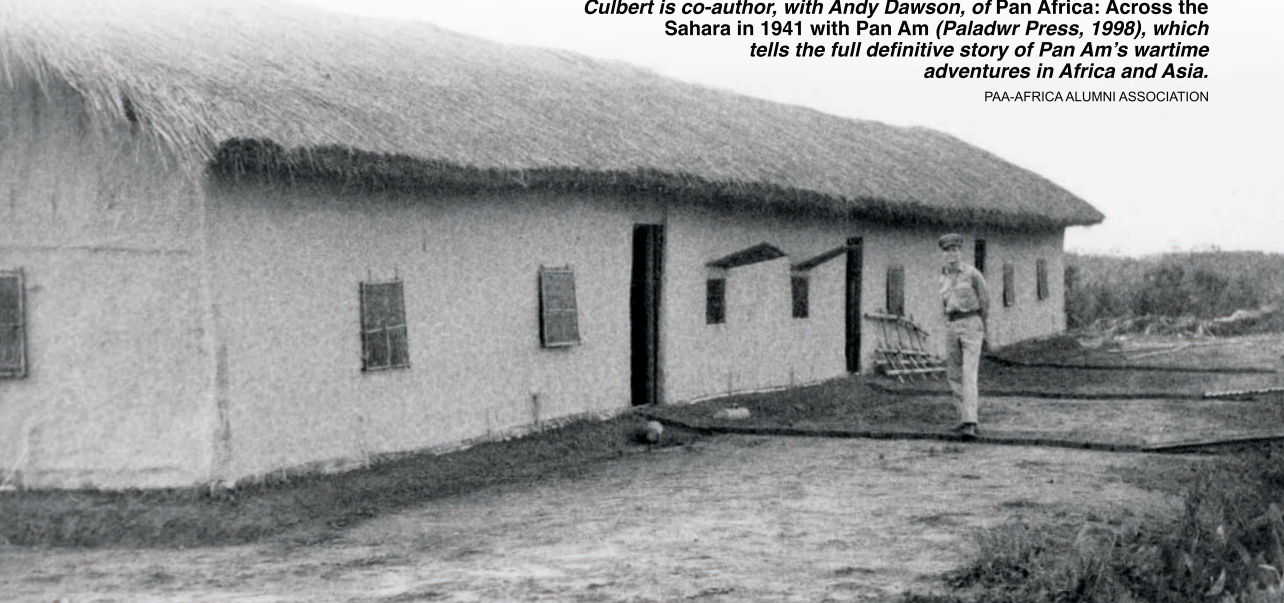
to launch twice-daily reconnaissance flights over the area of Myitkyina in north-eastern Burma. Information from tracking the advance of the Japanese forces was shared with all of the air transport units operating from Dinjan.

Fleeing the advancing Japanese, thousands of refugees swarmed on to the 3,000ft (900m)-long gravel airfield at Myitkyina in the hope of getting a seat on one of the Douglas transports and escaping to India. All four of the Dinjan units responded, and quickly added air evacuations to their daily mission planning.

In a report on joint operations at Dinjan during April 6–May 15, 1942, Dallas B. Sherman, PAA-Africa's Chief Pilot, described the often horrific conditions during these missions:

The Sealkote Tea Estate provided messing facilities for the PAA-Africa crews at Dinjan, this building serving as the crew mess hall. Tom Culbert is co-author, with Andy Dawson, of Pan Africa: Across the Sahara in 1941 with Pan Am (Paladwr Press, 1998), which tells the full definitive story of Pan Am's wartime adventures in Africa and Asia.

PAA-AFRICA ALUMNI ASSOCIATION





LEFT PAA-Africa Captain Wayne Eveland and his First Officer, Millard Nasholds, stand beside C-47-DL serial 41-7729 (c/n 4208) after a Japanese air raid damaged its port tailplane at Loi Wing on April 28, 1942. It was repaired and back in service within three days. Ironically, having survived one of the harshest environments of the war, it was destroyed in a fire at Newark, New Jersey, in March 1946.

BELOW Desperate times call for desperate measures — wounded British soldiers on stretchers are placed in the shade of a C-47's wing while awaiting evacuation from Myitkyina to Dinjan in April 1942. Pilots also had to contend with ferrying refugees suffering from tuberculosis, dysentery, cholera, smallpox and malaria.

BELOW Former Pacific Alaska DC-3 NC19971 (c/n 2261) is seen here in CNAC service (as #47) at Li Kiang, China, during one of the first flights across the Hump, on November 23, 1941. PAA-Africa's Chief Pilot Dallas Sherman stated that "surrounded by the 'fog of war', our operations in the Assam-Burma-China combat zone were to a large degree hidden, uncertain and confusing to both the participants and the directors. To accomplish results under actual combat conditions, many methods and means were employed, which of necessity appear abnormal and unusual. They were."

PAA VIA AUTHOR





The PAA-Africa crews shared the airfield at Loi Wing with the pilots and equipment of the 1st American Volunteer Group — the famous “Flying Tigers” — one of whose Curtiss P-40s was photographed by a PAA-Africa crew member. A pair of P-40s was obtained from the AVG to provide at least some fighter cover for the transports operating out of Dinjan.

“In addition to the possibility of enemy occupation of territory, it was established that many of the remote regions in the supposedly friendly territory [were] inhabited by ‘head hunters’ and other unfriendly Burmese or Chinese tribes. The use of parachutes by crew members was out of the question on most flights due to the presence of passengers for which parachutes were not provided. Advance weather reports were inadequate or lacking entirely. Guards with instructions to shoot were employed on each flight carrying refugees or soldiers, because of possible ‘fifth-column’ presence. Many of the wounded, sick or refugees had diseases of questionable contagion. Vomiting and other sicknesses aboard the aircraft was the normal reaction of the refugees due to fright, fatigue and inadequate or improper food. The stench of gangrene was noticeable in most of the cabins. No adequate methods of cabin fumigation or sanitation were available.

“At each airport from which evacuees were removed, the control progressed steadily from bad to worse. Loading went from weighed and listed passengers to wild mobs pushing their way aboard in uncertain numbers and weight. There was one instance of a man forcing his way aboard with a gun. He was later removed by gun threat before take-off. Many injustices were done in rejection of certain refugees and in the acceptance aboard of others — but this was to a large degree unavoidable under the circumstances.”

Don Stoeger, a PAA-Africa pilot, made his first refugee evacuation mission on April 17, when he picked up 52 evacuees. He later recalled:

“Because of the imminent danger to the fleeing civilians and soldiers, pilots were quickly influenced to add progressively to the number of passengers loaded irrespective of aircraft c.g. [centre-of-gravity] loading and maximum-gross-weight limitations from short-field situations. Pilots were fully aware of the fact that the extreme aft c.g. of the aircraft, caused by excessive overloading, was way beyond any reasonable limits and presented an exceedingly dangerous flight condition. In the face of advancing enemy troops, each flight became more of a desperate attempt by skilled and responsible pilots to help these unfortunate people without killing them — or ourselves — in the process.”

HEROIC EFFORTS

Other evacuation flights filled the Douglas transports with up to 73 refugees; the aircraft were designed to carry fewer than 30 passengers.

There were heart-rending scenes as family members were separated from each other at the airfield. Try as they might, pilots could not get all of the refugees aboard their aircraft. On some occasions the engines were used to blow the crowds back from the aircraft. In addition to wounded British, Chinese, and Indian soldiers, the evacuees included diplomats, journalists and



ABOVE Captains Ziegler and Eveland (third and fourth from left facing camera) take a break from offloading their precious cargo — civilian refugees fleeing the Imperial Japanese Army in Burma — for a photograph at Dinjan in April 1942. The work of the four units was arduous, dangerous and vital in establishing the “Aerial Burma Road”.

family members of employees of Standard Oil, Coca-Cola, Kodak and the Burma Oil Company.

Several of the sorties performed by No 31 Sqn are detailed in official records:

“On April 24, 123 personnel of the Royal Indian Army Service Corps were flown from Dinjan to Myitkyina and 161 casualties were brought back. On April 25 results were even better. In 23hr 45min of flying, 182 personnel with rations and equipment were flown to Myitkyina and 15,000 pounds [sic] of currency and 45 CMA [presumably Corps of Military Accountants] personnel were off-loaded at Dinjan. On May 4, 369 persons were off-loaded at Dinjan, and on May 5, 520 personnel, of whom 367 were casualties, were brought out from Myitkyina.

“From the beginning of March to May 20, a total of 8,616 persons, including 2,600 wounded, was flown out of Burma to India and 109,652lb [49,737kg] of supplies were dropped to isolated garrisons.”

On May 5 the Japanese advanced closer to the airfield at Myitkyina. Colonel Sutherland, an American serving in Myitkyina with the British forces, suggested to Dinjan that operations into the airfield be suspended. The RAF and CNAC were alerted, but on May 6, four RAF Douglas machines were caught on the ground at Myitkyina during an air raid by the Japanese. Two were destroyed with loss of life.

Myitkyina had fallen. The four air transport units ended their evacuation missions. Those refugees who did not get out by air had two

choices; walk the 270 miles (430km) to India, or stay and take their chances with the Imperial Japanese Army.

THE WILD EAST

The issue of American civilians supporting military operations in an active combat zone did not go unnoticed. There was a complete lack of published guidance on numerous operational matters, including insurance, employees without military status, responsibility for equipment and the limits on an aircraft captain’s authority. Additionally, there was no way to communicate with PAA corporate officials to validate the rules under which the civilian crews were to operate. These questions were not a cause of major disruption, however — supporting the mission was the most important goal.

On May 6, the final day of the Myitkyina evacuation operation, civilian PAA-Africa crews delayed their take-offs from Dinjan to await the latest information on the ground situation at Myitkyina. Missions were cancelled when word was finally received that two RAF aircraft had been confirmed destroyed on the ground and that the Japanese had taken control of the airfield. Although the lives of more than 8,000 retreating soldiers and refugees had been saved, all the horrors of war converged at this one small airstrip in Burma.

With the fall of Myitkyina and the onset of the monsoon season, PAA-Africa’s aircraft and crews withdrew from Dinjan on May 15. They returned

SUMMARY OF OPERATIONS OF THE ABCFC, APRIL 8–JUNE 14, 1942

Passengers & freight carried EASTWARDS

208 passengers	34,600lb	(15,695kg)
30,000 US gal of gasoline (100-octane)	840,000lb	(381,018kg)
500 US gal of oil	4,000lb	(1,815kg)
525,000 rounds of Bren gun ammunition	35,280lb	(16,000kg)
480,625 rounds of 0.5in-calibre ammunition	192,592lb	(87,358kg)
0.3in-calibre ammunition	6,552lb	(2,972kg)
Empty primed 12-gauge shotgun shells	33,712lb	(15,292kg)
Bren gunstand tripods	8,850lb	(4,014kg)
Incendiary bombs	16,000lb	(7,255kg)
Signal Corps equipment	3,000lb	(1,360kg)
1 x Army Jeep	3,250lb	(1,474kg)
2 x Ryan aircraft	4,600lb	(2,087kg)
Ethylene glycol	2,525lb	(1,145kg)
C-47 spare parts	3,455lb	(1,567kg)
P-40 spare parts and equipment for AVG*	88,823lb	(40,289kg)
Medical supplies	14,327lb	(6,500kg)
HALPRO Project equipment	25,726lb	(11,670kg)
Food	76,475lb	(34,688kg)
Cigarettes for the AVG	4,180lb	(1,896kg)
Post exchange stores for Gen Stilwell	4,000lb	(1,814kg)
Total weight, passengers & freight	1,401,950lb	(635,914kg)



Passengers & freight carried WESTWARDS

4,303 Passengers	647,150lb	(293,542kg)
Tungsten ore	47,240lb	(21,428kg)
Tin	53,716lb	(24,365kg)
Bombs to RAF Tezpur, India	5,000lb	(2,268kg)
Equipment to RAF Tezpur	600lb	(272kg)
Engine assemblies	4,500lb	(2,040kg)
Medical supplies for the RAF at Dinjan	200lb	(91kg)
Bombs for Dinjan (12)	420lb	(190kg)
Total weight, passengers & freight	758,826lb	(344,198kg)



Total passengers East & West	4,511	
Total weight of passengers East & West	681,750lb	(309,237kg)
Total freight, East & West	1,479,026lb	(670,875kg)
Total weight, passengers & freight	2,160,776lb	(980,112kg)

*AVG — American Volunteer Group

Author's note — not included in this list is at least one quart of Scotch and bacon carried in for Col Chennault

Source: Extracted From Brig-Gen C.V. Haynes, Letter to Lt-Col Samuel T. Moore, Historian, USAAF Tenth Air Force, April 20, 1943 (AFHRA Maxwell AFB)

to West Africa to support the ongoing RAF mission to Cairo as well as other Allied missions. Very little formal recognition was given to the PAA-Africa aircrew members who had participated in these pioneering Hump operations. The Chief of Staff of the USAAF's Tenth Air Force sent his personal appreciation for a tough job well done, however, and the men, who later joined the USAAF, eventually received belated recognition in the form of the Distinguished Flying Cross, awarded a year or so later.

Owing to the lack of landing fields in Burma, the remaining three units — No 31 Sqn, CNAC and the ABCFC — began to use air-drop methods to take food and supplies to military and civilian evacuees trekking out of Burma to India. Air-drop missions were either "free-fall" or "parachute" drops. Free-fall worked well for items like rice, but were hazardous to personnel on the ground. Parachute drops were subject to the availability

of nylon parachutes, which proved to be a highly desirable item for thieves. Finding the correct drop zone in the mountainous regions of Burma required great skill by both pilots and navigators.

Piecing together the known details of how these four units — No 31 Sqn, the ABCFC, PAA-Africa and CNAC — came together to operate against great odds is a story that needs to be told. The units operated with limited pre-planning and material support, yet they were able to initiate the aerial resupply system to China and Burma, and in doing so saved the lives of thousands of evacuees. These intrepid aviators were the true pioneers of the Aerial Burma Road, who provided the will and the fortitude to get the job done in the dark days of April–May 1942.



ACKNOWLEDGMENTS The Editor would like to thank Vic Flintham for his invaluable assistance with the preparation of this feature



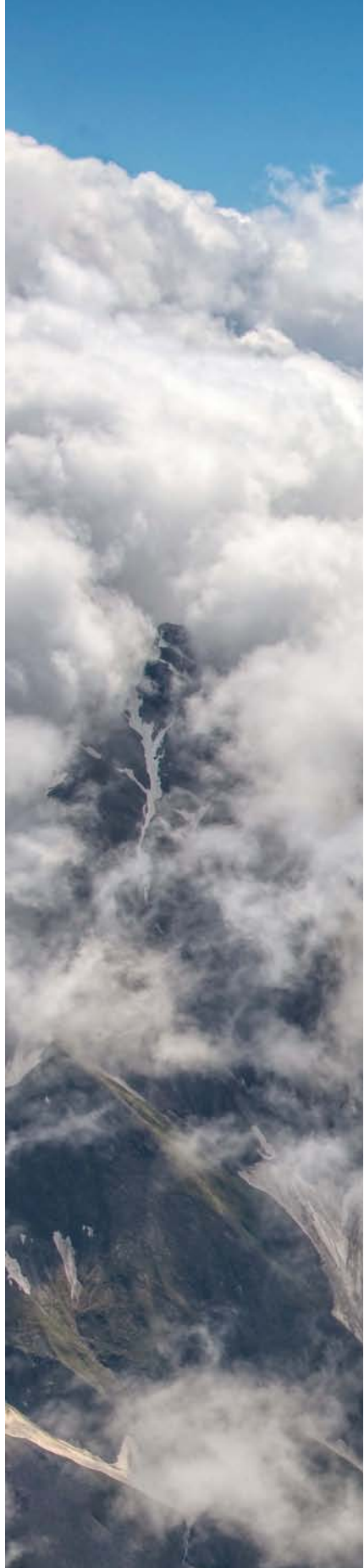
Switzerland's TIGER FORCE

Following on from his article on the Dassault Mirage IIIRs of the air arm's *Fliegerstaffel 10* in *TAH28*, Swiss Air Force specialist **PETER LEWIS** chronicles the four-decade — and still ongoing — career of the Northrop F-5 in Swiss service, and talks to one of Switzerland's most experienced F-5 pilots about what it was like to catch a Tiger by the tail

THE REASONS BEHIND the Swiss government's decision in September 1972 not to proceed with the purchase of a new combat aircraft — the American Ling-Temco-Vought A-7 Corsair II — are still not clear today, although it was stated at the time that the type's role in Swiss service was problematic. Although championed by the Swiss Army, the Corsair was possibly seen as being insufficiently adaptable; it was essentially a "bomb truck"; nothing more, nothing less. Indeed, during the Vietnam War, only the Boeing B-52 dropped more ordnance than the Corsair. With a new engine and updated avionics, the A-7D was developed as a specialist close-support machine for the USAF, and would have been the template for Switzerland's A-7G, which was ultimately never built.

THE NEXT GENERATION?

With the departure of *Oberstkorpskommandant* Eugen Studer in the summer of 1973 in protest over the government's decision, or lack thereof, the future fighter plans of the *Schweizer Flugwaffe* (Swiss Air Force) appeared to have reached a stalemate. The purchase of another 30 reconditioned Hawker Hunters from the UK as a contingency measure did little to appease the tactical planners, but it did keep airmen flying at a time when pilots were being dismissed owing to austerity measures imposed during the oil crisis years.



Eye of the Tiger — showing the type's distinctive “wasp waist” and razor-thin wings, one of the Swiss Air Force's F-5Es plays hide-and-seek in the clouds over the Swiss Alps in June 2014. Photographs by PETER LEWIS unless otherwise stated.





ABOVE In August 1974 two USAF F-5Es arrived in Switzerland to give the Schweizer Flugwaffe a comprehensive demonstration of the type's capabilities. The pair spent nearly two months operating from Swiss bases, including Emmen, Meiringen and St Stephan, where they are seen here in front of a typically dramatic Alpine backdrop.

The appointment of Oberstkorpskommandant Kurt Bolliger (**INSET, BELOW RIGHT**) as Studer's replacement led to a new analysis of Swiss air-defence policy. The idea of forming an "umbrella" of air-defence fighters over Switzerland was a unique concept during the Cold War. Put simply, such fighters would maintain surveillance flights over the nation and either attack or relay enemy movements in support of ground forces.

At this time Nato was not counting on Switzerland to be a partner against the Warsaw Pact. Indeed, Nato HQ in Ramstein, Germany, had made it clear that, during a conflict, any nation not in Nato would be treated as hostile. There was no hidden agenda that would have seen Swiss Air Force aircraft flying alongside Nato comrades in a united front against forces from the East. During the 1970s Swiss Dassault Mirage IIIS interceptors were ground-controlled from take-off until close to their targets, and only then was their radar engaged for a missile kill. Increasingly elderly Hunters and de Havilland Venoms were tasked with the ground-attack role, and, although the former had been equipped with Sidewinder air-to-air missiles (AAMs), they were never interceptors.

Switzerland did not have a dogfighting ethos as such at the time; each type had a specific role, largely historically based, reflecting little acknowledgment of the changing times and the advent of new highly manoeuvrable fighter jets.

The range and scope of fighters available in

1973 was wide; the concept of each often differed significantly from that of its rivals. The UK's Hawker Siddeley Harrier was still in its infancy as a true close-support aircraft and its range was still somewhat short, despite its obvious V/STOL advantages. France's Mirage F1 was not regarded as embodying a significant technical upgrade beyond the existing Swiss Mirage force that would pass parliamentary approval after the Corsair decision. These factors paved the way towards Hawthorne, California.



WHY THE TIGER?

In April 1974 Bolliger wrote an official report entitled *NKF [Neuen Kampfflugzeug]: Warum der Tiger?* — "New Fighter Aircraft — Why the Tiger?" — in which he provided an astute analysis of both the procurement potential and the military benefits of the Northrop F-5 Tiger for the Swiss Air Force.

Two aspects that Bolliger identified were the F-5E's cost/efficiency factor and its potential effectiveness as an ideal platform for both the *Überwachungsgeschwader* (UeG — Surveillance Wing) and militia squadrons (made up of non-military pilots serving in a part-time, essentially reservist capacity). With the USA developing four new air superiority fighters at the time — Grumman F-14, McDonnell Douglas F-15, General Dynamics F-16 and Northrop F-17 — it was clear that military tacticians saw such aircraft as the future.

Bolliger's report also noted that anti-aircraft



ABOVE Sporting a pair of wingtip-mounted Sidewinder missiles, F-5E J-3007, wearing the badge of UeG unit FIST 18, departs Runway 11 at Dübendorf on a training sortie. Note the original black nosecone, later replaced with a revised grey "shark nose". Motorway landings with F-5s were made for the first time at Münsingen in March 1982.

units and air assets are inherently linked, and that the basic infrastructure was sound for the threat-level facing Switzerland at the time. The nation's FLORIDA mountain-top radar network and Bristol Bloodhound air-defence missile system, added to the realisation that the air force's assets needed protection on the ground, were almost ahead of Nato thinking.

On August 8, 1974, a USAF Military Airlift Command Lockheed C-130 Hercules landed at Emmen in central Switzerland to provide ground-support equipment and personnel for a visit to be made by two USAF F-5Es, which flew in directly from the USA four days later. After seven weeks of operations from Emmen, Meiringen and St Stephan in central Switzerland, the pair departed for Ramstein on September 30, having demonstrated the Tiger's attributes to the Swiss Air Force.

The Swiss were clearly impressed, as on August 27, 1975, the government approved the provision of 1,170m Swiss Francs to fund the purchase of 72 F-5s — 66 F-5E single-seat fighters and six two-seat F-5F trainers — passed by the Swiss parliament on March 16, 1976.

In 1978 five Swiss instructor pilots were despatched to Williams Air Force Base in Arizona, USA, to spend four months converting to the F-5 to become instructors on the type. From day one, the USAF's dogfighting ethos was instilled by the American instructors.

Meanwhile, the first Swiss Air Force F-5Es began arriving in Switzerland, dismantled aboard USAF Lockheed C-5s, the first of which landed at Emmen on August 22, 1978. Exactly one

week later, the first Swiss F-5E made its maiden flight from Emmen, having been assembled by the *Eidgenössisches Flugzeugwerk* (Swiss Federal Aircraft Factory, aka F+W) there. Further C-5 delivery flights were made in September and October 1978 to Emmen, where F+W would take an average of eight months to assemble each aircraft. During 1978–79 USAF C-130s continued to deliver F-5 kits to Emmen, with their General Electric J85 engines being transported by air from Boston to Kloten, Zürich. Weapons, spares and ground equipment were transported by sea, with Basel their ultimate destination.

THE TIGER IN SWITZERLAND

With the return of the instructors from Arizona, the first UeG and militia squadrons began training on the new aircraft, most transitioning from the Hunter, which by that time had been in service for more than 20 years. While the Hunter had been a powerful adversary in the 1950s, by the 1970s it was obsolete as a dogfighter. The Israelis had made short work of Arab-operated Hunters during the Six-Day War of 1967. For the Swiss militia squadrons, the F-5 introduced the afterburner to the fight, along with the ability to evade superior numbers by speed if necessary. (The full-time UeG squadrons were already familiar with afterburner on their Mirage IIISs.)

The first Swiss Air Force Tiger pilot conversion course commenced in 1979 and three UeG squadrons (*Fliegerstaffeln* 1, 11 and 18) swapped their Hunters for F-5s. The militia squadrons transitioned almost in parallel; Alpnach-based FIST 19 joined the full-time FIST 11 as



ABOVE *Tigers under construction at F+W's assembly hall at Emmen. Each Tiger "kit" delivered from the USA would take an average of eight months to assemble, before the finished aircraft was test-flown and delivered to a Swiss Air Force unit. The airframes were rotated through the various units throughout the type's Service career.*

the first of the four militia units to adopt the Tiger.

Major Beat Neuenschwander recalls his early F-5 days when he became FlSt 18's first Tiger squadron leader in Payerne in 1980:

"We often flew three to four missions a day. The F-5 conversion courses for both professional and militia pilots were at Payerne. Initially there was no simulator, and all flight training was performed on the F-5F two-seat version. Later the RATRA (radar-training cockpit) was built and this simulated the radar, airborne threats and displays but without any visuals or motion involved."

On June 4, 1981, the Swiss parliament approved the purchase of another batch of Tigers, allocating 770m Swiss Francs for 32 additional F-5Es and six more F-5Fs, bringing the Swiss Tiger force up to 110. This follow-on order was less a vindication of the initial success of the introduction of the Tiger than a tactical decision to replace the ageing force of Venoms, whose days as an effective ground-attack platform were long over. By this time the Swiss Air Force was moving away from simply supporting the army and its ground-based goals in times of conflict, and was becoming an airborne force of its own with modern tactics.

The Swiss concept of air surveillance with the F-5 was initially limited to providing top cover for Hunters and Venoms during their ground-attack

missions, not as a combat air patrol (CAP), but in protection corridors and cells. Swiss military thinking during the 1980s was geared towards Hungarian and Czechoslovakian invasion forces sweeping west. Tactically, F-5 pilots were expected to report where they found the enemy and either attack or relay their sightings to other units. This was, however, openly broadcast via radio and susceptible to jamming. Formation leaders had to manage multiple targets for their units. When the Soviets shot down Korean Air Lines Flight KE007 over Sakhalin in the Sea of Okhotsk in September 1983, Switzerland increased its level of readiness, and F-5s were assigned to support the air-police role, in conjunction with the Mirage IIIS interceptors.

Having learned dogfighting lessons from USAF and Israeli pilots in the early 1980s, the Swiss Air Force recognised the need to change its air-

continued on page 35

CLICK HERE FOR FOLDOUT *Showing A pair of F-5Es, J-3095 and J-3074, make the most of the fading light above a stunning Alpine backdrop while on a sortie in December 2016. Nearest the camera, J-3095 carries a dayglo 275 US gal (1,041lit) fuel tank mounted on the fuselage centreline and an AIM-9P Sidewinder, or "Siwa" as the air-to-air missile is known in Switzerland, on each wingtip.*



ABOVE With F-5F J-3206 in FIST 11 markings in the background, Tiger pilots line up at the type's official handover ceremony at Meiringen on October 30, 1979. The two-seat F-5F was essentially similar to the F-5E, but with a fuselage lengthened by 3ft 6½in (1.08m) to accommodate the rear cockpit. The F-5F was fully combat-capable.

CLICK HERE FOR FOLDOUT SHOWING *Basking in the last rays of the early evening sun, F-5E J-3073 of FIST 8 generates a vortex off the wing root while up on a sortie from Meiringen in January 2018. This Tiger was part of the second batch acquired by the Swiss Air Force and entered service in March 1984. Note the two 20mm cannon in the nose, giving the Tiger a formidable bite for close-combat dogfighting.*

continued from page 34

combat doctrine. The idea that high-speed low-flying enemy aircraft could be intercepted and destroyed by guided missiles had proven to be a fallacy. Experience in Vietnam and the Middle East had demonstrated that dogfighting skills had to be re-learned. Of paramount importance was the positioning of a fighter for the "first shot". With judicious use of afterburner, the F-5 could be used aggressively in dogfighting situations, and although the Siwa was the primary weapon, switching to cannon was often done quickly.

Northrop was contracted to develop an active self-defence suite for Switzerland's F-5 force. The resulting centreline-mounted AN/ALQ-171(V) conformal electronic countermeasures (ECM) pod was not a success, however, despite Northrop's own "Survival Machine" advertising, which made impressive claims about its superiority in a radar-controlled-weapons situation. The Swiss Air Force was highly aware that future conflicts would rely heavily on radar and electronic warfare, but, despite strong lobbying in Bern, investment in airborne electronic warfare never happened. From the mid-1990s Fliegerstaffel 24 flew three specially configured F-5Fs, initially

with the VISTA IV and later VISTA V ECM pod. These were built by Ericsson in Sweden as the A100 Erihammer, purchased by Switzerland in 1993 and, as well as the Hunter, were used on the Pilatus PC-9 turboprop trainer and F-5F. The self-contained pod held antennas and electronics controlled by a single panel in the aircraft's rear seat. The VISTA system was used only to simulate threats, and not in an offensive role to lead cover fighters, i.e. as per the USAF's "Wild Weasel" tactical role.

TIGER OPERATIONS

By the mid-1980s, all of the Swiss Air Force's UeG and militia squadrons had transitioned to the Tiger. Militia Fliegerstaffeln 8 and 13 at Meiringen in central Switzerland were equipped with more than 24 Tigers, with up to eight reserve aircraft. Former F-5 pilot Beat Neuenschwander recalls the busy mountain valley base resembling the deck of an aircraft carrier:

"With four Tigers held on quick alert, there was often an overload, with eight to 12 aircraft looking to depart to the same training sector over the Alps within 3min of clearance from the command centre, while another two or three sections of F-5s were in the valley lining up for landing, often in poor weather, which would mean that all the GCA [ground-controlled approach] frequencies were being used."

In an attempt to simplify the landing phase during IFR (instrument flight rules) conditions at Meiringen, the Wing developed a new technique



The F-5E was designed for manoeuvrability rather than pure speed. This view of J-3005 shows some of the features which gave the type its remarkable agility, including the distinctive area-ruled "wasp waist", extremely thin wings with full-span leading-edge flaps (which worked in conjunction with conventional trailing-edge flaps), and tapered inboard leading-edge extensions, added to enhance airflow over the wing at high angles of attack.



for wartime conditions which allowed a fully autonomous tactical descent profile using the inertial navigation system (INS) to approach from the west over Interlaken until ground contact was established. During trials with four F-5s, the flight leader led the way, with his wingmen in radar contact streamed at a distance of 1½ nautical miles (2.8km) at a steady 300kt. This method was tried under visual flight rules (VFR) conditions and worked well, but it was never approved for regular peacetime flying.

In the same context of trying new ideas under wartime conditions, plans were mooted to use the long diagonal taxiway as a makeshift runway should the main runway and parallel taxiway ever be rendered unusable. Owing to safety concerns, however, mainly concerning the narrow taxiway and its undulating surface, plus the tight turn to port that would have to be made immediately after rotation, the idea was never tested.

Swiss F-5 squadrons were not allocated specific airframes; rather, aircraft were rotated to spread airframe hours between major maintenance and overhauls. Although the various units were keen to apply their badges and identities to the aircraft, this had no meaning other than that airframe had at one point served with a particular squadron.

Two F-5Es — J-3001 and J-3097 — were allocated to the civilian *Gruppe für Rüstungsdienste, Flugversuche* (GRD — Research & Development Flight Test Unit) at Emmen, but both were integrated back into the regular F-5 pool in the early 2000s.

WAR GAMES

Most F-5 flying hours were flown from the regular peacetime training bases at Dübendorf, Emmen, Payerne and Sion. Pilots flew IT (individual training) flights to maintain currency. Many militia F-5 pilots also had a full-time job flying with Swissair or other airlines and had to slot in their hours during their days off. Apart from the professional UeG squadrons, based at Dübendorf and Payerne for 49 weeks of the year, the militia squadrons only came together a few times a year.

Wiederholungskurs (WKs — refresher courses) comprised a three-week training period; the first week was allocated for refresher training and preparation while the second and third saw intense flight activity from the tactical bases. Normally inactive bases, including those with cavern and shelter facilities, sprung into life as ground units and security forces deployed.

The WKs often included wartime scenarios, which could involve the fitting of live AIM-9P Sidewinder AAMs, practising operations under NBC (nuclear, biological, chemical) conditions or with increased security on the airfield to simulate hostilities. Latterly, when no-fly zones were established around key political, economic

SWISS AIR FORCE F-5 UNITS

Unit	Base	Dates
FSt 1*	Turtmann	<i>Umschulungskurs</i> (UK — conversion training) 1983; 1984–2003
6^{ème} Esc	Sion	(UK 1984); 1985–94
	Turtmann	1995–2003
	Payerne	2004–present
FSt 8	Meiringen	(UK 1979–80); 1981–2017
FSt 11	Alpnach	(UK 1980); 1981–94
	Meiringen	1995–98
FSt 13	Meiringen	(UK 1984); 1985–94
	Payerne	1995–2003
FSt 18	Payerne	(UK 1979); 1980–94
	Sion	1995–97
FSt 19	Alpnach	(UK 1980); 1981–94
	Mollis	1995–99
	Buchs	2000–03
	Sion	2004–17
	Emmen	2017–present

* Marked in bold = UeG — *Überwachungs-geschwader* (Surveillance Wing); all other squadrons = militia units





ABOVE Two-seat F-5F J-3212 and single-seat F-5E J-3033 in close formation in April 2016. The F-5F was not used solely as a trainer, three examples also serving as electronic countermeasures mounts. Note the single cannon (to port) installed in the nose of the two-seater.



LEFT Militia squadron FIST 13's insignia incorporated an eagle with talons open, ready to take its prey, along with the unit's number. The eagle motif was liberally applied to various F-5s used by the squadron during its annual refresher courses. The unit started receiving its Tigers in 1984, but was disbanded in 2003.

BELOW Carrying a dayglo AIM-9P Siwa on the starboard wingtip and an equally vivid 275 US gal centreline fuel tank, F-5E J-3057 is run through the J85 engine start sequence by militia personnel at Turtmann in the canton of Valais in March 2003. Note the camouflaged door of the hardened shelter built into the mountainside in the background.





ABOVE The Swiss Air Force's formation aerobatic display team, the *Patrouille Suisse*, transitioned to the F-5E in 1995, after more than 30 years of operations with the Hawker Hunter. **INSET RIGHT** The *Patrouille*'s Nos 1 and 2 soloists pull up into the vertical over the Axalp range during the team's 2019 training day, showing off the Swiss crosses on their undersides.

or sporting events, Tigers were tasked with flying CAPs with two live AIM-9Ps. Fictitious "war-game" scenarios were often created during WK deployments, casting one base as "Red Air" against "Blue Forces" from another, and there were often opportunities to fire live ammunition at one of the many ranges at Alpachersee, Axalp, Forel and Wasserfallen.

Militia support units were instructed by professionals of the *Bundesamt für Militärflugplätze* (BAMF — Federal Authority for Military Airfields), who performed the same jobs during regular peacetime flight activities. There were also usually a couple of TKs (*Trainingkurs* — training courses) every year, flown from the training bases but without the full militia groundcrews that would normally accompany squadrons to their wartime bases. The TKs usually incorporated a professional F-5 instructor pilot, assigned to accompany the pilots through their flying duties.

Swiss F-5s first ventured abroad in 1981, and again in 1986, to Vidsel in northern Sweden. *Sardinien Kampagne* (SAKA) training exercises were undertaken in Sardinia during 1985–89 and at RAF Waddington in the UK from 1990 until 2000 for the *Nordsee Kampagne* (NORKA). One F-5F also operated from Manching, Germany, for a Nato exercise in 2007.

After the Hunter was retired at the end of 1994, the Swiss Air Force's formation aerobatic display team, *Patrouille Suisse*, converted to the



F-5E, 12 being painted in a distinctive red and white colour scheme. Several of these had one of their cannon removed to accommodate smoke-generation equipment in the forward cannon bay.

TECHNICAL SUPPORT

The main maintenance and overhaul base for the Tigers was at Interlaken in the Bernese Oberland region of central Switzerland, where both onsite and offsite workshops dealt with hydraulics,



instruments and avionics. Buochs, near Lucerne, handled Sidewinder missile checks; and, along with the test facility at Ennetmoos near Alpnach, was the centre for all J85 engine maintenance. The F-5 force was well supported by local aerospace companies, the Tiger's systems being relatively simple and easy to support. When Interlaken was closed in the 1990s, F-5 work was already on the wane as the reduction in the Tiger fleet started, and airframe work moved back to Emmen.

There were few substantial changes in technical equipment during the Tiger's Swiss Air Force career. The INS was updated, a VHF radio added to replace the second UHF set and a new altimeter measuring feet instead of metres was introduced in the 1990s. Chaff/flare dispensers were added to the ECM suite and the revised grey "shark noses" fitted to later production F-5Es were retrofitted to the first batch of single-seaters, but nothing more substantial has been changed over more than 40 years of service. There have been no major upgrades. Problems that cropped up, such as longeron cracks, were repaired as necessary. When the F-5 had its combat status withdrawn in 2017, the associated stocks of Sidewinders were disposed of, although they were initially also carried by the F-5's replacement — the McDonnell Douglas F/A-18 Hornet — before the first delivery of more modern AIM-9X missiles.

The two militia Tiger units that remain active

today, Fliegerstaffeln 6 and 19, are effectively pilot pools, one in the west at Payerne and one at Emmen. These squadrons now purely make up "Red Air" tactical units to fly against professional Hornet squadrons, although some target-towing duties are still flown from Meiringen under the umbrella of *Zielflugstaffel 12* (Aerial Target Squadron 12).

MOVING THE TIGERS ON

In February 2003 the USA's Department of Defense (DoD) announced an \$18.5m fixed-price contract for the purchase of 32 Swiss F-5Es, required as a one-for-one replacement for "Adversary" Tigers retired after reaching their airframe-fatigue limits. The ex-Swiss Tigers were redesignated F-5Ns for US Navy service, following the reinstallation of the type's original black nose and major refurbishment at Northrop Grumman's factory in Florida.

The F-5Es were dismantled and stowed on a purpose-built shipping frame at Emmen before being loaded aboard a US Navy C-130 Hercules and flown to the USA. The F-5Ns are flown by the US Navy and US Marine Corps from Naval Air Station (NAS) Key West in Florida, Marine Corps Air Station Yuma in Arizona and NAS Fallon in Nevada. Another 12 Tigers followed the first batch, and a grand total of 44 F-5Es was flown out from Emmen to Florida.



SWISS AIR FORCE VIA AUTHOR

ABOVE Anton Locher at Fairford in the UK after having delivered an F-5E to the Patrouille Suisse for a RIAT display. As a production test pilot, “Tiger Toni”, as he is known in Switzerland, has accrued more hours on the F-5 than any other Swiss Air Force pilot.

LEFT Fighting strong westerly winds along the Rhône valley, a Tiger of FIST 1 departs Turtmann in March 2003. During 2004–08 Austria leased 12 F-5Es from the Swiss, all of which were returned after Austria’s acquisition of Eurofighter Typhoons in 2007. “Tiger Toni” was a regular visitor to Graz-Thalerhof, where he performed test pilot duties for the Austrians.

Yet another 22 Swiss F-5 airframes are due to head back across the Atlantic from 2021, \$39.7m having been approved by the DoD in 2019 for more Tigers. This time F-5Fs will also be part of the deal, Switzerland intending to keep only a handful until they are finally withdrawn from service, which is expected to be in 2025.

FLYING THE TIGER

When the Tiger finally sees retirement from Swiss Air Force service, Anton “Tiger Toni” Locher will have flown more hours in the F-5 than any other Swiss pilot, having accrued some 3,250hr on the type. A production test pilot with experience of every type in the Swiss Air Force inventory, Toni started his F-5 conversion course at Dübendorf in January 1984, when the BAMF had a requirement for an F-5 pilot at its Emmen base.

Having completed the Tiger conversion course, Toni continued his militia flying career with FIST 13 at Meiringen, from which he had flown the Venom from 1981. Both of the Meiringen-based F-5 squadrons, Fliegerstaffeln 8 and 13, were air-defence squadrons, although FIST 8 was later assigned to close-air-support and FIST 13 was disbanded after relocating to Payerne after the arrival of FIST 11 with its new F/A-18s. He recalls:

“During my FIST 13 deployments, we once fully loaded an F-5E to see how she’d fly. We hung four 400kg [880lb] bombs, took a full load of

560 rounds of 20mm ammunition, two AIM-9P Sidewinders and a full central tank. There wasn’t an empty pylon left, and although I couldn’t have taken her up to 45,000ft [13,700m], we certainly got her off the ground intact. Although my use of the afterburners was a little more frequent than usual, the flying characteristics were fine.”

Toni often flew more than 150 hours a year on the Tiger, his job entailing checking out each aircraft after airframe and engine repairs or overhauls. He remembers:

“The 150hr airframe minor check saw the aircraft down for around a month, while the 300hr major check was a three-month shop visit. The J85 engines were also on their own set of limitations, checks and overhaul cycles, so, each time something was changed, I had to make a check flight to ensure that everything was within parameters. I used to get ‘stick’ from the regular pilots as they thought that we factory pilots would ‘joy-fly’ around for an hour for fun, burn 7,000 Swiss Francs of fuel and come back for lunch. It wasn’t like that. We had a strict set of test parameters that both the aircraft and engines had to meet, all the way up to Mach 0.95 and 45,000ft — and if they didn’t check out, we would not release the Tiger back to the Air Force pool.”

According to Toni, the two trickiest airfields to fly into were Alpnach and Interlaken. Approaching Alpnach’s Runway 01 was unnerving,



ABOVE This one-off formation of four F-5Es with colourful unit tail markings was put together for a photographic sortie in the summer of 2017. In ascending order: J-3074 "PA Capona 31" of Flight Training Unit 31; J-3073 with the "Vandalo fish" motif of FIST 8; J-3033 with 6^{ème} Esc's marching duck, and J-3038 sporting FIST's 19 stylised swan emblem.

requiring a pilot to "crab" into the confines of the valley and then turn left for the final line-up, while exposing the aircraft's belly to the Lopper, a shoulder of Mount Pilatus extending into Lake Lucerne, without being able to see it. He recalls:

"We flew a lot from Interlaken as this was where the F-5's Competence Centre was. The short 1,500m [4,900ft] runway was less than ideal, especially when it was wet; and if we had to use Runway 05, the railway tracks were just before the threshold. The F-5 snagged the wires on the railway's overhead electric wires a few times.

"We had to have an engineering understanding of what was going on with the aircraft in case we weren't getting the indications we expected or wanted, and trying to localise specific issues required a deeper understanding of every part of the Tiger, whether instruments, electrical, hydraulic or mechanical systems. We used Northrop's own flight and test procedures, adapting some of the modification parts that were unique to Switzerland."

Toni looks back with great fondness on his time flying the F-5:

"It was a great aircraft to fly; you just had to watch your energy management, as those knife-thin wings weren't giving you too much control. And landing had to be mastered by flying on to the runway because of the high speed, and the fact that it wasn't at all similar to the Hunter. We never really made an effort to upgrade the F-5. The Tiger I flew on my last mission on July 31, 2015, was identical in every way to that of my

NORTHROP F-5E DATA

Powerplant 2 x General Electric J85-GE-21-A turbojet engines, each rated at 5,000lb (2,268kg)-thrust with afterburner

Dimensions

Span	26ft 8in	(8.13m)
with missiles	27ft 11½in	(8.53m)
Length	48ft 2in	(14.68m)
Height	13ft 4in	(4.06m)
Wing area	186ft²	(17.3m²)
Wheel track	12ft 5½in	(3.8m)
Wheelbase	16ft 11½in	(5.17m)


Weights

Empty	9,583lb	(4,346kg)
Max take-off	24,675lb	(11,192kg)
Combat	13,250lb	(6,010kg)
Max wing loading	133lb/ft²	(649kg/m²)

Performance

Maximum level speed at 36,000ft (11,000m) at combat weight	Mach 1.63	
Maximum cruising speed at same	Mach 0.98	
Stalling speed, flaps down, power off	143 m.p.h.	(230km/h)
Max rate of climb	34,500ft/min	(10,500m/min)
Service ceiling	51,800ft	(15,800m)
Combat radius	673 miles	(1,083km)

first flight all those years before; we'd only ever added the VHF radio. When I saw [Northrop's] F-20 Tigershark [the F-5G that never was] I knew that it would have been one formidable aircraft for Switzerland."

The Tigershark is another story, however, and it is unlikely that the Tiger's even sleeker single-engined offspring would have enjoyed quite such a long career as its stalwart predecessor. 



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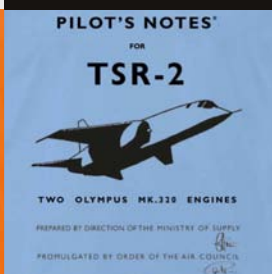


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FRANCE'S AIR PIONEERS: LOUIS DAMBLANC

In the second part of his series on “those magnificent Frenchmen” who risked their reputations, fortunes — and often lives — to further the cause of aviation across the Channel, French aviation historian **JEAN-CHRISTOPHE CARBONEL** takes a look at Louis Damblanc and his intriguing but ultimately fruitless attempt to develop his Alérion twin-engined rotary-wing aircraft

THE STORY OF the Alérion (named after a heraldic small spread-eagle) begins in November 1915, when, on the 6th, *Messieurs* Alexis Beurrier, Emile Bigourdan and Louis Lacoïn applied for a patent for “a rotary-wing aircraft with the general shape of an aeroplane, with the specific arrangement that two nearly-horizontal propellers replace the usual single vertical example”. The machine described in the patent includes many features incorporated on the later Alérion, including independently orientable shamrock-shaped rotors for steering, the axles of which were not only supported by a girder structure attached to the fuselage but also linked by upper supporting beams.

The patent received an addition a year later, on November 2, 1916, describing “a special device to control the blades of the rotor so as to achieve simultaneously a positive and negative incidence, as used during a descent with the engine declutched, so that the propellers may rotate in the same direction while they are slowed either by engine or special brake arrangement”. The patent was also filed in the USA in 1917 and in Austria in 1920. The latter may have been prompted by the revelation of the rotary-wing research completed by István Petrőczy, Theodore von Kármán and Karl Balaban during the First World War.

Of the three patent applicants, only one — Louis Lacoïn — has left a trace in history. As

BELOW With one of its two intended *le Rhône* rotary engines and only one of its rotary wings fitted, Louis Damblanc's Alérion is prepared for testing at Villacoublay on September 14, 1920. Damblanc had dismissed the co-axial concept and was instead pursuing the idea of two laterally mounted rotors, as per Louis Lacoïn's patents.

PHILIPPE RICCO COLLECTION VIA AUTHOR



Professor of Thermodynamics at l'École Centrale, in 1908 Lacoïn published a book about internal combustion engines. What enabled the project to evolve from a patent into a full-scale manned aircraft was a meeting with Louis Damblanc.

L'INGÉNIEUR DAMBLANC

Damblanc was born on June 29, 1889, in the Gers region of south-western France. After gaining his diploma at *École nationale supérieure d'ingénieurs électriciens de Grenoble*, he established an engineering consultancy bureau in 1915 in association with an *École d'Arts et Métiers* engineer called Tuffery. It was wartime, however, and Damblanc was drafted into the army — as a nursing officer. He was soon reposted to the *Direction des Inventions* (Inventions Directorate) of the *Ministère de la Guerre* (War Ministry).

At that time the French Army was intrigued by the application of helicopters as artillery-spotting aircraft, to replace the “sausages” — tethered balloons — that festooned the front. Before the war, the Ministry had shown some interest in helicopters, without really knowing what role to give to them. *Capitaine* Paul Lucas-Girardville, working at the Vincennes Polygon fort east of Paris, tried to design his own helicopter, but without success. As a result, his commanding officer, *Général* Jean Estienne (the future French “father of the tank”) sponsored two inventors, Alphonse Papin and Didier Rouilly, to develop their studies for a jet-powered helicopter. They managed to build their machine, but tests undertaken with it in early 1915 were unsuccessful and the aircraft did not succeed in taking off. [See *Messieurs Papin et Rouilly's Astonishing Whirling Leaf by the same author in TAH 27 — Ed.*] Nieuport, then building light fighter aircraft, was also asked to design a helicopter, and, although construction was started, it was probably never completed. In this context, it is easy to see how the two-seater aircraft drawn in the Beurrier-Bigourdan-Lacoïn patents, with its passenger seated in the nose of the machine, forward of the engine, might appear to be the perfect answer to military requirements. Thus the War Ministry asked Damblanc to study helicopters.

Although Damblanc claimed that his initial meeting of minds with Lacoïn — the time and place of their first meeting is unknown — was along the lines of improving the safety of aircraft by giving them the ability to take off and land vertically (a preoccupation vindicated by the *Aéro-Club de France* in the preface to its rules for the award of prizes issued after the First World War), it seems that military applications of vertical flight were also in his mind. In a Royal Aeronautical Society lecture at the Royal Society



AGENCE MEURISSE VIA AUTHOR

ABOVE A studio portrait of Louis Damblanc circa 1920, the year his paper on “*The Problem of the Helicopter*” was presented to the Royal Aeronautical Society in London. Damblanc was certainly present at the lecture but, according to a report by C.G. Grey in *The Aeroplane*, he opted not to present it himself.

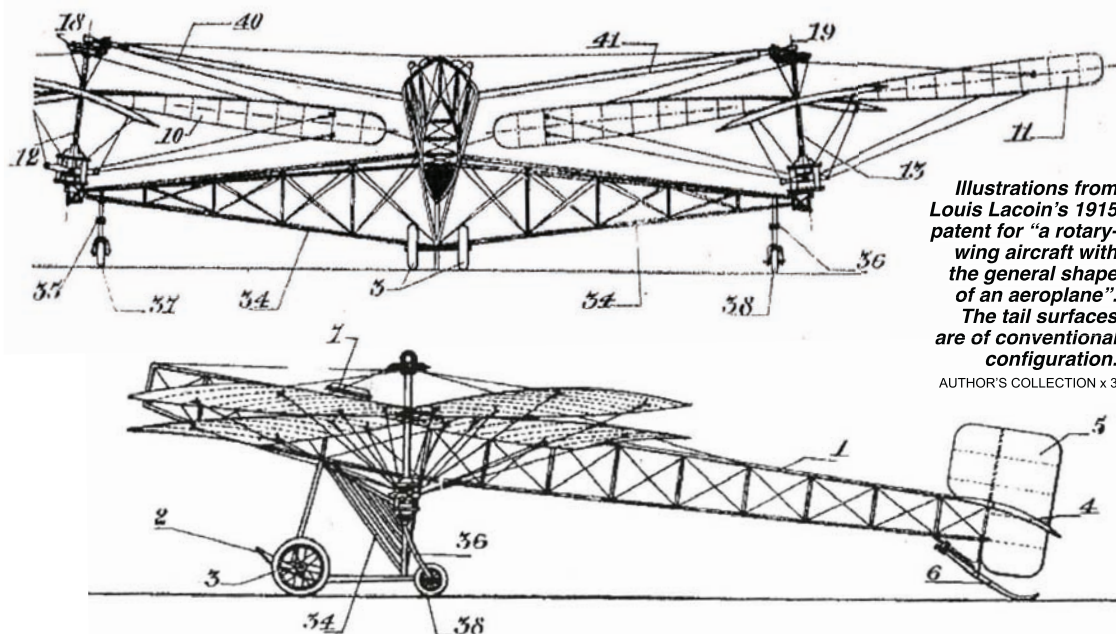
of Arts in London on November 18, 1920, a paper prepared by Damblanc stated:

“For military purposes the helicopter will be an incomparable observation machine, and when its horizontal speed becomes equal to that of an aeroplane, a formidable bombing machine. For work at sea its advantages are evident. Aeroplanes cannot land on the decks of warships — except in the face of great difficulties and with the aid of special and encumbering landing decks, which involve a waste of space which can scarcely be tolerated.

“The helicopter alone is capable of getting over these difficulties in a satisfactory manner. By its use it will be possible to rise vertically from the deck of a ship and to land in the same way. Merely to mention these several applications is to justify the interest which has been taken in the attempts to develop this type of machine.”

DESIGNING THE ALÉRIÛN

Damblanc, after undertaking unsuccessful trials with co-axial rotors, finally opted for the two side-mounted rotors promoted by Lacoïn and his two patent partners. (Curiously, Damblanc appears to have dismissed the tail-rotor concept, known at the time, having been incorporated



Illustrations from Louis Lacoïn's 1915 patent for "a rotary-wing aircraft with the general shape of an aeroplane". The tail surfaces are of conventional configuration.

AUTHOR'S COLLECTION x 3

into the Ornis helicopter designed by French pioneer Henri Villard in Belgium.) At the London conference, Damblanc explained:

"It is necessary in any scheme for a helicopter to split up the lifting force between two airscrews or pairs of airscrews turning in opposite directions in order to avoid the rotation of the machine itself around the axis of the airscrew. There only exist two separate types: the machine with the single axis [co-axial] and that with separate axes. Advantages of the single-axis: great mechanical simplicity and consequent lightness. Advantage of separate axes: better aerodynamic efficiency of the lifting airscrews."

Another aspect studied by Damblanc was the optimal number of blades in each rotor;

he arrived at four and gave the rotor disc a diameter of 7m (23ft) — but whether this was a result of his own calculations or influenced by Lacoïn and his colleagues is unknown.

Damblanc stated in his lecture paper:

"The blade of a lifting airscrew is comparable in dimensions to the wing of an aeroplane, but the loads which it has to carry are not similar. Its actual construction should be carried out with spars and ribs and particularly strong bracings, the whole covered with fabric and doped exactly like the wing of a monoplane."

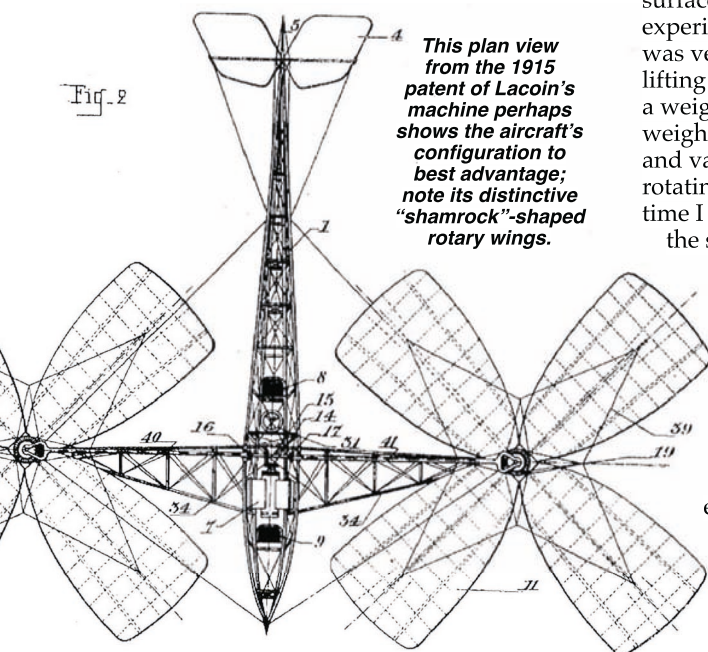
This was all fine, but he added:

"The weight of a lifting airscrew will, all other things being equal, obviously be greater than the wing of an aeroplane of the same surface. During the recent construction of an experimental helicopter I have found that it was very difficult to build a blade of such a lifting screw giving a high factor of safety for a weight of less than 8kg/m^2 [1.64lb/ft^2]. This weight included all the bracings, fabric, dope and varnish, in fact the whole weight of the rotating wing in working order. At the same time I believe that by reducing the diameter of the screws from 7m to 6m [19ft 8in] and taking

speeds of rotation of the order of 150 r.p.m., the weight per square metre can be reduced to 7kg [1.43lb/ft^2]."

Those two "rotary wings" — an expression coined by Damblanc and Lacoïn according to French magazine *l'Aérophile* — were driven by two 120 h.p. le Rhône rotary engines, each rotor being powered by its own engine. Damblanc rather optimistically claimed that with the rotors inclined 10° forward, the Alérion could reach

Fig. 2



This plan view from the 1915 patent of Lacoïn's machine perhaps shows the aircraft's configuration to best advantage; note its distinctive "shamrock"-shaped rotary wings.



AUTHOR'S COLLECTION x 2

ABOVE & LEFT *The Alérion begins to come together at the Institut Aérotechnique de St-Cyr during the winter of 1919–20. The rotary wings were constructed along the same lines as a conventional wing, with ribs and spars that were to be covered with fabric and doped. The undercarriage was carried on a standard V-frame with an aerodynamic fairing fitted to the axle.*



a speed of 189km/h (117 m.p.h.). The question of the thrust/lift required from each rotor was investigated at the *Laboratoire des Arts et Métiers* using a scale model of a four-bladed propeller of 105cm (3ft 5in) diameter on September 5, 1918, under the control of M Cellerier, as reported in *l'Aérophile*:

"At 1,169 r.p.m. the propeller gave a thrust of 18kg [40lb], requiring 3.47 h.p. to do so. The inventors, by interpolating those results for each of the 7m-wide propellers rotating at 160 r.p.m., concluded that each would give 666kg [1,468lb] of thrust, hence 1,320kg [2,910lb] together."

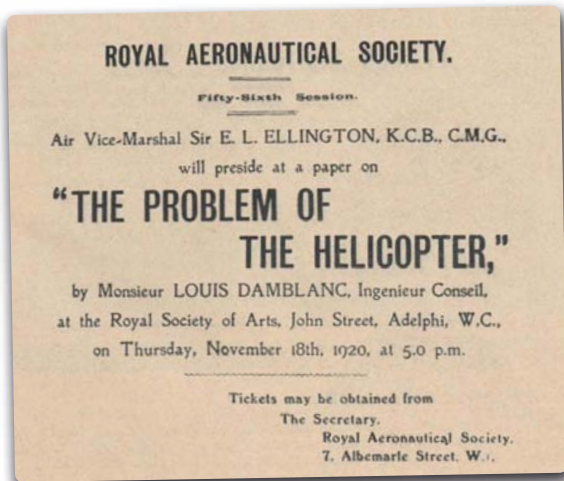
This was estimated to be enough to lift a

1,200kg (2,646lb) Alérion. However, these calculations drew criticism from Ernest Archdeacon, a lawyer by profession and a philanthropist who promoted aviation and was among the founders of the *Aéro-Club de France*, who, in the same issue of *l'Aérophile*, warned: "If anything goes wrong, if they [the designers] eat more power than expected, if they need to reinforce or strengthen this or that part, it is feared they will not be able to achieve lift-off". He was also dubious of the calculated maximum speed — "the speed of an excellent aeroplane!"

Criticism regarding the extrapolation of the power calculation from the model to the full-size machine was also levelled at Damblanc's work by A. Boyer-Guillon (*ingénieur civil des mines*, head manager of the test laboratory of the *Conservatoire National des Arts et Métiers*). This developed into an ongoing polemic between Boyer-Guillon and Damblanc in the wake of the later full-size experiments, the latter expressing the view that laboratory tests were not a solution to "the problem of the helicopter", preferring to tackle the question by continuing full-scale tests.

CUTTING METAL

The full-size Alérion was built at the *Institut Aérotechnique de St-Cyr*, part of the University of Paris, in the second half of 1919. As suggested by Damblanc, using two rotors enabled the incorporation of streamlined outriggers



"ONE HAS ONLY TO READ THE NUMEROUS PATENT SPECIFICATIONS WHICH HAVE BEEN TAKEN OUT CONCERNING HELICOPTERS TO REALISE THAT MOST OF THE AUTHORS HAVE HAD EITHER THE MOST ELEMENTARY OR THE MOST FANTASTIC IDEAS..."

— Louis Damblanc, November 1920

ABOVE *The notification of the presentation of Damblanc's paper to the Royal Aeronautical Society in London on November 18, 1920. Although Damblanc's English was good, he persuaded Percy Noel, Founding Editor of American magazine Aero and Hydro, to present it for him and act as interpreter during the subsequent discussion.* AUTHOR'S COLLECTION

and a reduction in bracing wires. Although Damblanc claimed he could dispense with bracing wires altogether, photographs show that he did not in reality. The fuselage structure remained uncovered to avoid aerodynamic interference with the rotors. At the rear of the fuselage, conventional fin, rudder and tailplane surfaces were installed for control. According to *l'Aérophile*, the tailplane surfaces could be pivoted vertically during ascent.

Of particular note was the Alérion's ability to descend safely to the ground in case the engines had to be stopped. Damblanc considered this "the most vital point in the problem of the helicopter," and envisaged two options in such an event: autorotation with the rotors rotating freely, or a glide to the ground using the stopped rotors as wings, as on an aeroplane (the reason for incorporating large rotor blades like

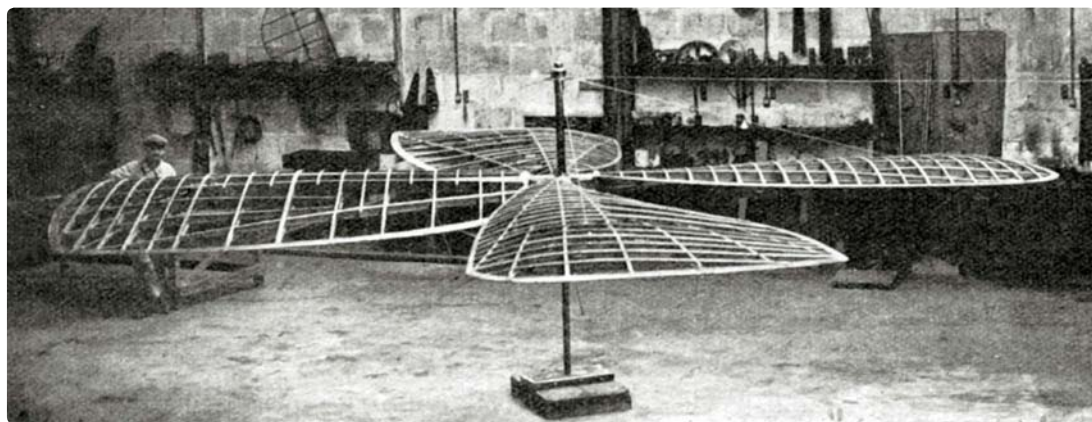
shamrock-leaves). However, Damblanc himself was wary of the latter option:

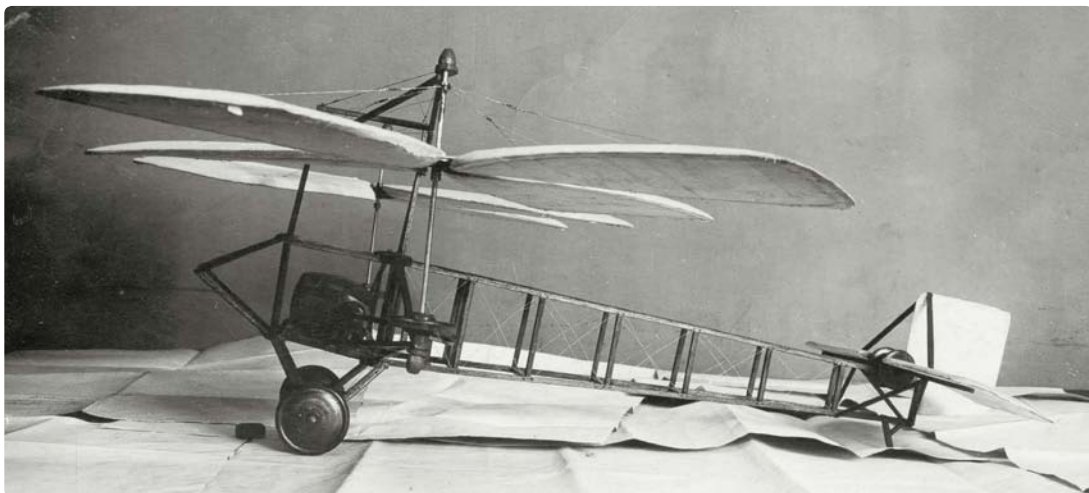
"I have very little confidence [in this solution]. It is equivalent to turning the helicopter into a very bad glider which will descend in a path very much as an aeroplane does. The total surface of the glider in this case will always be less than the sum of the real surfaces of all the blades of the airscrews. This 'cut up' surface will have a very poor efficiency because of the very unfavourable conditions under which the blades have to work. The real surface available for gliding with fixed airscrews will also always be inferior to the surface swept out by the same airscrew in rotation."

An issue given particular attention by the designers was gearing, leading to two patents being co-granted in 1919 to Lacoïn and Damblanc. Neither patent refers specifically to aviation but the second, regarding a "clutching and declutching device acting automatically depending on speed", may have referred to a system in which the rotors could "windmill" automatically in case of engine failure in flight.

Another novel feature of the Alérion was a device to warp each blade at any point of its

AN ALÉRION ROTARY WING IN THE WORKSHOP / AUTHOR'S COLLECTION





ABOVE Two views of the model of the Alérion which may have been displayed at the 6^e Salon de l'Aéronautique in Paris in December 1919 and January 1920. The fuselage remained uncovered to avoid aerodynamic interference with the rotors, but presumably also to keep the machine's weight down; it would need all the help it could get.

rotation, thus providing variable pitch. This was intended to allow the pilot to move the centre of lift acting on the rotors, as he would use ailerons or tail surfaces on a conventional aeroplane.

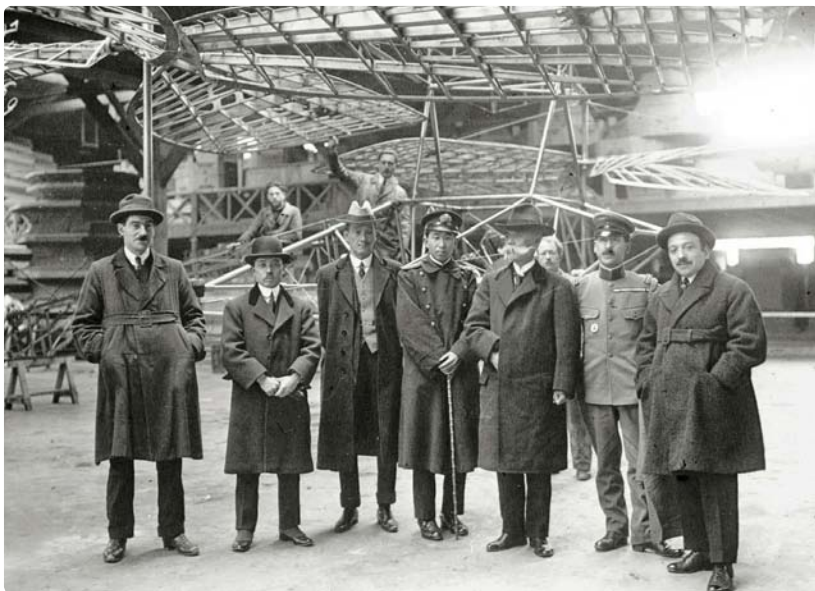
FINANCING THE ALÉRION

Although constructed under the auspices of the French War Ministry, work on the Alérion was privately funded. In May 1917 Damblanc and Lacoin established the *Société d'Aviation l'Alérion*, in which Damblanc took the role of technical director. He confided, however, that he struggled to finance his project: "I was stopped in the assembly of my machine by a lack of funds after spending a few hundred thousand Francs. Fortunately, the French State elicited some interest in it and now the task may go on".

As Ernest Archdeacon put it: "The inventors [of the Alérion] have succeeded in interesting the administration of our country sufficiently to have their Alérion bought by the *Section Technique de l'Aéronautique* [STAé] for an undisclosed sum, to be paid after successful testing. The financing of those tests has been paid under a contract between the French

[War] Ministry and the inventors, and 100,000 Francs has been paid in advance through the acquisition by the French State of various patents owned by the inventors". Archdeacon makes a further comment about the "rare phenomenon" of a state financing aeronautical experiments, although Papin and Rouilly, and Nieuport, had previously received development contracts from the Ministry. Damblanc, however, claimed to have spent 350,000 Francs of his own money before receiving the 100,000 Franc "advance" from the Ministry. This funding (again described as an "extraordinary event" by Jacques Mortane in *La Vie Aérienne Illustrée*) must have arrived rather late in the conception of the machine, probably around early 1919. Mortane (who wrote enthusiastically about the Alérion) added that "funding had stopped Ingénieur Damblanc". This is confirmed by *Commandant Maurice Lamé* in his definitive tome *Le vol vertical et la sustentation indépendante: hélicoptères, gyroptères, avions-hélicoptères*, who indicated that the actual construction of the Alérion had been delayed for lack of funding.

The Alérion was not displayed at the 6^e Salon



LEFT In January 1920 Damblanc and the Alérion were paid a visit by Japanese General Count Gaishi Nagaoka, seen here third from right. Damblanc is furthest right. As well as being an important figure in early Japanese aviation, Nagaoka was also renowned at the time for having the world's second-largest moustache!

BELOW The Alérion is prepared for testing at Villacoublay on September 14, 1920. Only one rotary wing has been fitted and the empennage, comprising fin, rudder and tailplane, is also missing.

de l'Aéronautique held at the Grand Palais in Paris from December 19, 1919, to January 20, 1920 (the first Paris Air Salon since the war), for a good reason: it was still under construction at the time. However, a display model may have been exhibited there. On January 31, Lt-Gen Gaishi Nagaoka, head of Japan's military balloon organisation, invited by the Aéro-Club de France, was given a tour of the Damblanc workshop. Around the same time, Italian First World War ace (and future Italian Air Attaché in Paris) Pier Ruggero Piccio also visited the machine. The February 1920 issue of *La Vie Aérienne Illustrée* stated that the Alérion was expected to begin testing at Villacoublay airfield, south of Paris, in March.

It was not until early July 1920 that the completed machine was brought to Villacoublay airfield. Curiously, that same month, Damblanc published a science-fiction short story depicting

the flight of the *Titan*, an airliner of the future on the Brest—New York route, in *La Vie Aérienne Illustrée* — without a single helicopter.

A SHORT TEST PROGRAMME

The test programme for the Alérion was established by Damblanc in co-operation with the STAé, and comprised two stages. The first included the running of a single engine; checking the functioning of the clutch device, manual and automatic, at low speeds and for different blade incidences; the plotting of polar curves (a graph contrasting the sink rate of an aircraft with its horizontal speed); an evaluation of the influence of the "warping device" on the movement of the thrust point, and the establishment of a suitable piloting technique.

The second stage involved the running of both engines; a vertical take-off attempt with the stabilisation of the machine at a height of

PHILIPPE RICCO COLLECTION VIA AUTHOR





PHILIPPE RICCO COLLECTION VIA AUTHOR

2m (6ft 6in); a “normal” take-off” (possibly meaning with a horizontal run along the ground, although this would appear to be difficult to achieve with the Alérion) with stabilisation of the machine at a height of 2m; reaching a height of 20m (66ft) after a vertical take-off; completing a closed circuit of about 500m (1,600ft); a vertical landing with power, and a vertical landing with engines stopped. The maximum speed to be attained was 50km/h (31 m.p.h.).

In a previously published article, I wrote that the Alérion performed well during the first phase of the tests but crashed during an attempted “high-speed” flight. However, a recently rediscovered account of the tests by Maurice Lamé reveals that the tests initially progressed slowly: “The tests were not overly satisfying; the clutching device and the whole drive required a lot of tuning, only after which M Damblanc could put one of the rotary wings in motion via one of the two engines”.

Yet, some of the objectives of the first stage had been accomplished by late July–early August, and *La Vie Aérienne Illustrée* reported at the end of August that the plotting of the polar curves had been completed.

Lamé recounted the fateful day when a full engine run was attempted as follows:

“This experiment took place on September 14, 1920, at Villacoublay. Damblanc, once installed in the pilot’s seat, started the right [starboard] engine, which progressively provided power to the right wing [rotor], the only one installed. The aircraft was [counter-] balanced by weights on the other side. The engine reached 1,100 r.p.m., the [rotor] turning at 137 r.p.m. with a reduction ratio of 8:1 within a few minutes. Then, the speed of the engine having been slightly increased, the upper part of the aircraft broke.

ABOVE *Crunch! Taken a few minutes after the photo opposite, this one shows the Alérion after the engine run, during which substantial damage was inflicted; the rotor was all but destroyed, as was the shaft on which it was fitted and the upper lateral support beam. It was the end of the short career of the Alérion.*

The pilot was slightly injured by blades moving outside their normal trajectories.”

The upper part of the machine that broke was the lateral beam connecting the two rotor shafts. Damblanc and an STAé official suffered minor injuries. Sadly, this was the end of the story for the Alérion. Damblanc later explained that

DAMBLANC/LACOIN ALÉRION DATA

Powerplant 2 x 120 h.p. le Rhône rotary engines, driving two shamrock-shaped rotary wings, each rotating at 169 r.p.m.

Dimensions

Span	15m (49ft 2½in)
Fuselage	
length	9.2m (30ft 2¼in)
width	1.2m (3ft 11¼in)
Area	
Total area of rotary wings	8 x blades of 5m² (53.8ft²) each = 40m² (430.6ft²)
Stabilisers	4m² (43ft²)
Rudder	1.4m² (15ft²)

Crew

Weight

Take-off, incl pilot, fuel and oil for 30min flight	1,200kg (2,646lb)
---	-------------------

Performance

Maximum speed (estimated)	180km/h (112m.p.h.)
Endurance	30min


his contract with the War Ministry stipulated that the machine's first flight must take place before October 15, 1920, leaving him insufficient time to rebuild it before the deadline. Many felt that Archdeacon's original criticism — that the Alérion contained "too many new devices, each of which would have required extensive testing" (according to Edmond Blanc in his *Toute l'Aviation* educational book of the 1930s) — was vindicated. Damblanc initially declared that the accident would not stop development of the Alérion; but after further consideration, he chose not to mention it at all during his RAeS lecture in London in November 1920.

BEYOND THE ALÉRION

Damblanc had invested a great deal of time, money and effort in the Alérion, and decided to continue his research into rotary-wing development. During 1921–22, with continued support from the War Ministry, Damblanc developed a series of small unmanned "parachute helicopters". His experiments with these succeeded in landing a 60kg (132lb) model by means of autorotation. Nothing of any further note, however, came out of these tests.

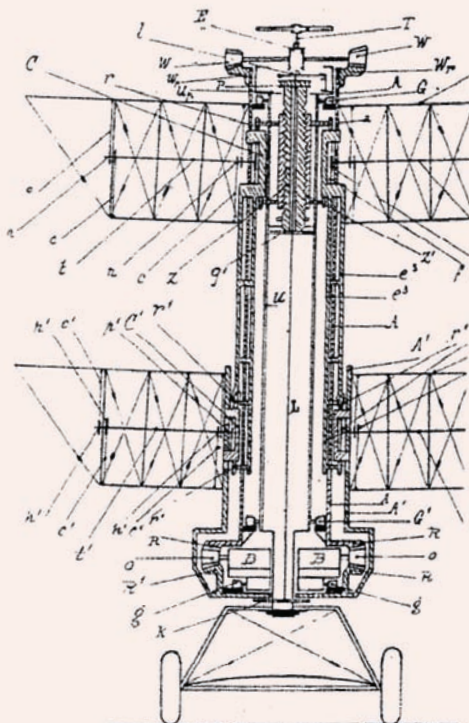
In 1922 Damblanc returned to co-axial rotors and patented in France a curious helicopter with a vertically oriented fuselage (containing pilot, passengers, engines, fuel and oil tanks, cargo bay and all control systems). A "regulating propeller" on top of the machine could be oriented in any direction to control manoeuvrability, direction, and stability of the flying-machine. What remained unclear was whether, after a vertical take-off, the fuselage could fly horizontally, like a form of proto-Focke-Wulf Triebflügel.

In 1921 Damblanc had toyed with rocket propulsion adapted for helicopters, but did not even bother to patent any of his ideas. It was rocket propulsion, however, which would provide the direction for his future career in aero/astronautics, for he was to become extremely active in rocket design during the inter-war years, and ultimately became the inventor of the multi-stage rocket (patented in France in 1936 and in the USA in 1939).

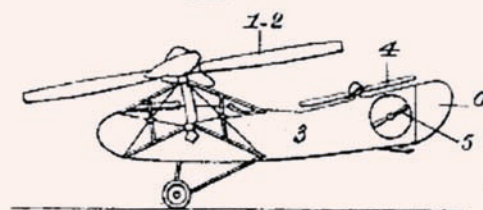
And what of Damblanc's partner Lacoïn? In 1923 he patented what he must have considered his input into the design of the Alérion: "A helicopter configuration in which all the horizontal surfaces of an aeroplane are replaced by propellers, so as to reduce to a minimum the resistance to ascent". In 1926 he applied for a patent for another Alérion-like design integrating within the tail structure a lateral propeller system, anticipating by 40 years the Aérospatiale "fenestron" system, as used on the Gazelle and other successful helicopters. 

FURTHER EXPERIMENTS ...

NOT A MAN to be deterred easily, Louis Damblanc continued experimenting with rotary-wing designs after the failure of the Alérion, as did his erstwhile partner Louis Lacoïn ...



ABOVE One of the illustrations included in Damblanc's 1922 patent for an intriguing helicopter design; quite how it was to work remains something of a mystery, although it may have operated on a similar basis to the later German Focke-Wulf "Triebflügel" concept.



ABOVE Of more recognisably conventional configuration was Louis Lacoïn's 1926 patent describing an Alérion-type machine — but, interestingly, with what appears to be an early incarnation of the "fenestron" ducted-fan later used in various French helicopter designs.

ACKNOWLEDGMENTS The author and Editor would like to thank Philippe Ricco for his invaluable assistance with obtaining illustrations for this feature

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WINGS OVER PERU

The Douglas 8A in Cuerpo Aeronáutico del Perú service

Latin American aviation specialist **AMARU TINCOPA** continues his occasional series on the history of military aviation in Peru with the story of the Northrop-designed Douglas 8A in *Cuerpo Aeronáutico del Perú* service, with which the type saw combat in Peru's 1941 conflict with neighbouring Ecuador, as well as during three domestic uprisings in 1948



IN THE SUMMER of 1937 the *Cuerpo Aeronáutico del Perú* (Peruvian Aeronautic Corps — CAP) launched a modernisation programme aimed not only at the replacement of a number of aircraft on its inventory which were obsolescent and/or approaching the end of their operational careers, but also the acquisition of a light ground-attack aircraft. The *Comandancia General de Aeronáutica* (Aeronautics High Command — CGA) ordered the establishment of an ad hoc unit, the *Comité Técnico de Adquisiciones* (Technical Committee for Acquisitions — CTA), which was tasked with the selection and evaluation of potential candidates for purchase.¹ The basic requirements established by the committee for the CAP's ground-attack aircraft were as follows:

- Type — two-seat monoplane;
- Construction — metal;
- Powerplant — 800 h.p. radial piston engine;
- Bombload — not less than 500kg (1,100lb);
- Undercarriage — retractable;
- Armament — 4 x 7.65mm (0.3in)-calibre fixed machine-guns + 1 in a flexible position.

The evaluation process started in January 1938 with the Italian Caproni Bergamaschi AP.1 monoplane, which was quickly discarded, as its technical characteristics did not comply with the requirements established by the CTA.² The process continued with the evaluation of other Italian types, including a Breda Ba.65 monoplane equipped with a Breda Type M turret, Meridionali's Romeo Ro.37 biplane with an A.30

inline engine, plus two designs from the USA; the Douglas 8A (an updated version of the US Army Air Corps' A-17, originally designed by the Northrop Corporation, which was part-owned by Douglas and taken over fully by the latter in 1937) and Seversky's 2PA-204 (sold to the Imperial Japanese Navy Air Force as the A8V1).

By mid-July 1938 the CTA had completed its evaluations and issued its report to the CGA, ruling the Douglas 8A as the winner and recommending the purchase of 20 airframes.³ However, shortly after the Peruvian government notified Douglas of its intention to purchase the type, Congress in the USA opposed the sale, stating that the manufacturer was committed to rearming the USAAC and was therefore unable to fulfil any other requirements.⁴ Eventually, after a great deal of political manoeuvring, clearance was granted for the sale of ten Douglas 8As to Peru, the contract being signed in August 1938.⁵

The Peruvian 8A

The Douglas 8A-3P, as the Peruvian variant was designated by the manufacturer, differed from the USAAC's A-17 in having a retractable undercarriage (although the USAAC's A-17A was also so equipped) and a semi-retractable bomb-aiming tub, as well as a more powerful 1,000 h.p. Wright R-1820-G103 Cyclone engine in place of the A-17's 825 h.p. Pratt & Whitney R-1535 Twin Wasp Junior.

With these refinements the 8A-3P could achieve a maximum speed of 238 m.p.h. (383km/h)

OPPOSITE PAGE, TOP Showing the type's distinctive perforated flaps for dive-bombing, one of Peru's initial batch of Douglas 8A-3Ps undergoes flight testing in the USA before delivery.

MCPHAIL VIA AUTHOR

MAIN PICTURE A line-up of Peruvian training aircraft at Las Palmas airfield, Lima, in 1956. Nearest the camera is an 8A-3P, with an 8A-5, fitted with machine-gun gondolas, alongside.

AUTHOR'S COLLECTION





ABOVE With only the red, white and red vertical bars of the rudder providing any clues as to its intended destination, one of Peru's original ten 8A-3Ps, all built at Douglas's El Segundo factory, is test-flown over the California coast in late 1938 or early 1939. Seven of the 8As were transported to Peru by ship and three were delivered by air.

at 8,695ft (2,650m), with a service ceiling of 24,000ft (7,300m). The internal fuel load gave the 8A-3P a range of 650 miles (1,050km) and a 305-mile (490km) combat radius. Armament comprised four fixed Browning M1919 0.3in-calibre machine-guns mounted in the wings, plus another on a flexible mount operated by the bomb aimer/wireless operator, and a 1,210lb (550kg) bombload carried internally and on external racks.⁶ The aircraft retained the A-17's perforated flaps, which allowed dive-bombing attacks.

Delivery and entry into service

Delays affected the start of production and it was not until early November 1938 that the first 8A-3P rolled off the assembly line, the remaining examples following at a rate of three per month. By early March 1939 testing and acceptance had been completed and the aircraft were cleared

for delivery. Seven airframes were dismantled, crated and taken by rail to Los Angeles harbour, where they were loaded aboard a steamer bound for Callao, near Lima, arriving later that month.

In the meantime, the remaining three 8A-3Ps were delivered by means of a long-distance formation flight, the trio departing Los Angeles for Lima on the morning of May 31, 1939.⁷ The aircraft were flown by Lt-Cdr Armando Revoredo Iglesias with Capt Jorge Virgil Morey as radio operator/flight engineer; Lt Enrique Espinoza Sánchez with Oscar Espejo as radio operator, and Ernesto Gómez Cornejo carrying Federico Vera in the rear seat, and completed the following stages: Los Angeles—El Paso, Texas; El Paso—Brownsville, Texas; Brownsville—Tapachula, Mexico; Tapachula—Panama City and Panama City to Lima, with a refuelling stop at Chiclayo in north-western Peru. Having covered some

BELOW Three of the 8A-3Ps await their formation delivery flight to Peru on the tarmac at El Segundo in May 1939. The first of the Peruvian 8A-3Ps to be completed made its maiden flight on November 21, 1938, and the ten were given c/ns 412–421. The 8A traced its heritage back to the Northrop Gamma 2F, developed into the USAAC's A-17.

MCPHAIL VIA AUTHOR





ABOVE For the 4,700-mile (7,600km) delivery flight from Los Angeles to Lima, the three 8A-3Ps were given the serials BO-1G to BO-3G, the first of which is seen here during the flight on June 4, 1939, with Lt-Cdr Armando Revoredo Iglesias at the controls and Capt Jorge Virgil Morey in the rear seat as radio operator/flight engineer.

4,700 miles (7,600km), the flight landed safely at Limatambo airport in Lima at 1745hr on June 5, after a total flight time of 24hr 45min.

On their arrival, the seven crated aircraft were sent to Las Palmas airfield, where they were assembled and tested by Douglas personnel, who had accompanied them by ship. The aircraft were then assigned to the recently activated XXXI *Escuadrón de Información y Ataque* (31st Information & Attack Squadron — XXXI EIA), a reconnaissance and ground-support unit based at Las Palmas under Lt-Cdr Revoredo. The unit comprised three *Escadrillas* — Nos 91, 92 and 93 — of three aircraft each, representing a total of nine aircraft (plus one reserve) on strength.

With the arrival of the remaining aircraft from the USA in June, the unit began an intense operational training programme at Las Palmas, which was completed in September 1939, at which point XXXI EIA was declared fully operational.

In early 1940 Revoredo began planning an ambitious long-distance tour of South America as a means of projecting Peru's air power and demonstrating the high level of preparedness of the CAP. An ad hoc unit, named "*Los Zorros*" (The Foxes), was created for the purpose and was made up of five aircraft, to be manned by a group of highly experienced officers. On the evening of March 23, 1940, the five 8A-3Ps left Limatambo bound for Quito, the Ecuadorean capital, for their first stop.

The next morning, as the flight prepared to depart Quito, 8A-3P serial XXXI-2, flown by Capt José Bernales, hit a boulder located at the edge of the Mariscal Sucre airport runway while taxiing, incurring damage to one of its wingtips and rendering the aircraft unfit for flight. Revoredo

ordered Bernales and his mechanic to wait for a spare wing from Lima, while the group continued to Bogotá, Colombia.⁸ Bernales then flew the repaired machine back to Lima.

The remaining four aircraft continued the tour, visiting Bogotá, Caracas in Venezuela, Paranaibo, Belén do Pará, Fortaleza and Rio de Janeiro in Brazil, Asunción in Paraguay, Montevideo in Uruguay, Buenos Aires in Argentina, Santiago de Chile and, finally, La Paz in Bolivia, covering some 11,125 miles (17,900km) before landing back at Limatambo on the morning of May 3, 1940.

The first operational loss of an 8A-3P was recorded on April 12, 1941, when Lts Luis Cossio Tudela and Bernales suffered an engine failure, resulting in a fatal crash, at Ckari, near the city of Cuzco in the Andes. The pair were taking part in a nationwide tour aimed at raising funds for the National Armed Forces Reserve.

Action over Ecuador

On July 5, 1941, escalating border tensions between Ecuador and Peru erupted into a full-blown conflict after Ecuadorean army elements allegedly attacked Peruvian posts along the border, prompting a swift response from the Peruvian government. In Lima, the latter seized the opportunity to deploy its superior armed forces and launch a large military operation against the weaker Ecuador, with the aim of forcing the Quito government into negotiations to resolve the border dispute once and for all.

Not involved in operations during the early stages of the conflict, XXXI EIA was kept at readiness at its home base of Las Palmas. However, on July 24, 1941, it was reassigned to No 1 *Grupo Aéreo* (No 1 Air Group — 1 GA) and

Four of the five 8A-3Ps that set off on the CAP's five-week tour of South America in 1940, dubbed "Los Zorros", during their visit to Rio de Janeiro, Brazil. The fifth was forced to return to Lima after damaging a wingtip while taxiing in Ecuador at the beginning of the tour. IEHAP VIA AUTHOR



and ordered to deploy to the *Teatro de Operaciones del Norte* (Northern Operations Theatre — TON).⁹ That morning XXXI EIA left Las Palmas at 1000hr and headed north, bound for Teniente Coronel Pedro Ruiz Gallo airbase in Chiclayo, where the 8A-3Ps arrived at 1230hr. Shortly after, at 1400hr, No 91 Escadrille departed Chiclayo for a secondary airfield located at Piura, where the unit spent the night. The next morning, 1 GA issued a directive ordering No 91 Escadrille to deploy to the forward airfield at Tumbes and establish its command there, which was accomplished by 1130hr. The following day, 1 GA Command ordered the transfer of XXXI EIA's remaining escadrillas from Chiclayo to Talara, where they were stationed to await further orders.

Combat came for XXXI EIA on July 27, 1941, when a pair of No 91 Escadrille 8A-3Ps — serials XXXI-91-1 and XXXI-91-3 — took off on an armed reconnaissance sortie over the Ecuadorean towns of Cuenca and Santa Rosa at 1645hr. Bad weather, however, prevented a clear view of Uzcurrumi Bridge, one of the sortie's objectives, which had been attacked by Peruvian Caproni Ca.310 bombers, and the aircraft landed back at their base at Tumbes at 1812hr.

Bridge demolition

Two days later XXXI EIA received orders to destroy the bridges at the villages of Federico Páez and Uzcurrumi, and to attack the bridge at Arenillas and the Ecuadorean Army units stationed nearby. A formation of 8A-3Ps departed Tumbes at 1115hr, each armed with six 30lb (13.5kg) anti-personnel and four 110lb (50kg) demolition bombs, the latter causing significant damage to the bridges. The sortie continued with an attack using machine-guns and the anti-

personnel bombs on Ecuadorean army elements, before the aircraft returned to Tumbes at 1330hr.

July 30 marked No 92 Escadrille's operational debut as two aircraft, XXXI-92-2 and XXXI-92-3, undertook an armed reconnaissance sortie over the Ecuadorean defensive positions around Arenillas and the north bank of the Santa Rosa River, as well as over Chacras, the town of Santa Rosa's railway station and other objectives. The two 8A-3Ps were scrambled from Talara at 1045hr, and on reaching their designated targets, successfully attacked Ecuadorean army positions on the north bank of the Santa Rosa River and around Arenillas with 4½lb (2kg) anti-personnel bombs. The aircraft returned to Talara to re-arm, before repeating the attack and returning again at 1520hr, reporting that the majority of Ecuadorean army units had abandoned Santa Rosa.

A sortie by No 91 Escadrille was also flown on July 30, the unit searching for Ecuadorean army movement in the Quebrada Seca—Jubones—Girón—Tarqui—Cuenca areas.

On the morning of July 31 No 91 Escadrille flew a number of sorties in support of airborne operations aimed at capturing the towns of Machala, Santa Rosa and Puerto Bolívar, and attacked troop concentrations around Pasaje. The unit also provided air support to forces advancing towards those towns. At 1115hr the same day No 93 Escadrille was redeployed from Talara to Tumbes, where the unit commander received orders to perform an armed reconnaissance around Macará and its surroundings. During this sortie a number of targets of opportunity were attacked and intense groundfire was reported between La Toma and Macará.

Meanwhile, the 8A-3Ps of No 91 Escadrille attacked supply barges discovered around Puerto

Wearing the original bare-metal finish in which the aircraft were delivered and their somewhat long-winded unit codes — XXXI for the Escuadrón; 92 for the Escadrille and 1 for the individual aircraft — a formation of 8As patrols over Peru's northern coastal region in July 1941, at the time of the conflict with Ecuador, also known as Guerra del '41 (The War of '41).



Bolívar before proceeding eastwards towards Machala, where they attacked a horse-drawn convoy loaded with supplies. The aircraft then struck an army truck convoy and two infantry companies near Girón and Tarqui, causing heavy casualties among the Ecuadorean forces.

Ceasefire — but flying continues

The first day of August saw a ceasefire. Operations, however, continued as No 91 Escadrille flew a “top cover” sortie for *Ejército Peruano* (Peruvian Army — EP) forces landing at Puerto Bolívar and Machala. Four days later No 91 undertook reconnaissance sorties over Pasaje, Guabo and Uzcurremuni to confirm reports of Ecuadorean forces in the area.

The next morning two 8A-3Ps — XXXI-91-2 and XXXI-91-3 — escorted a Caproni Ca.111 transport of the 105 *Escuadrilla de Transporte* (105 ET),

carrying a high-ranking EP officer, from Tumbes to Santa Rosa, before undertaking reconnaissance duties over Machala.

A violation of the ceasefire by Ecuadorean forces on August 9 led to a renewal of hostilities, XXXI EIA returning to flying retaliation strikes against objectives in Guayaquil and Cuenca. The following day No 91 flew to Sullana, from where the unit's 8A-3Ps performed an armed reconnaissance sortie over the areas of Macará, Zabiango, Carlomagno, Loja, Célida, Laceiba, Zapotillo and Alamor. Meanwhile, No 92 flew to Piura in order to re-arm, as the bomb stocks at Tumbes were exhausted, before heading for Sullana. From the latter an uneventful armed reconnaissance patrol was undertaken over the areas of Alamor, Zapotillo, La Ceiba, Saucillo, Carlomagno, Sapiango and Macará.

On August 22, 8A-3P XXXI-93-3 returned to

The damage to XXXI-91-2 of No 91 Escadrille is inspected by CAP personnel after a landing mishap at Villa auxiliary airfield in October 1941. That month the conflict with Ecuador drew to a close and the 8As were recalled to Lima, where most had returned by early November. AUTHOR'S COLLECTION





ABOVE The CAP's 8As were used extensively during the conflict with Ecuador, often as bombers; here an 8A-3P is rearmed with fragmentation bombs before another bombing sortie from Tumbes forward airfield on the Peru-Ecuador border, in late July 1941. The 8A was also fitted with a pair of Browning 0.3in machine-guns in each wing.

No 93 Escadrille after undergoing repair at Las Palmas. Two days later No 91 flew the American military attaché from Tumbes to Santa Rosa, and on August 25 No 92 flew an armed recce patrol in search of Ecuadorean forces over the road towards Pucará, Guanazán and Yulo.

After a lull in operations XXXI EIA returned to action on the evening of September 11, its units performing a number of sorties against Ecuadorean Army units near Porotillo, in retaliation for a bloody ambush against an EP reconnaissance patrol earlier that day. Operations continued three days later when Ecuadorean army positions in and around Pucará, Santa Isabel, Jubones canyon and Uzcurremuni were attacked by the 8A-3Ps of Nos 92 and 93 Escadrillas. Several sorties were flown against the towns of Piedras and Piñas on September 19, in which a total of 383 FN SS-34 ammunition cartridges, as well as 20 x 30lb and 10 x 25lb (11kg) bombs, were used.

Hostilities between Peru and Ecuador finally came to an end with both nations' signing of the *Acuerdo de Talara* (Talara Agreement) on October 2, 1941.¹⁰ According to the terms of this document, both sides set about the demilitarisation of the border and, accordingly, the gradual withdrawal of units to their home bases was put into effect, XXXI EIA withdrawing from Sullana to Talara the same day at 1310hr. After performing various drills and exercises, most of the unit had returned to Lima by early November 1941.

Back at Las Palmas leave was granted for the unit's crews while all its aircraft were sent to the *Arsenal de Aeronáutica*¹¹ for mandatory inspection and overhaul, much needed after three months of constant operations from poorly prepared air-

fields. The unit suffered another loss of men and materiel when 2nd Lt Cesar Benavides Bielich and 3rd Class Sub-Officer Tito Martin Lynch were killed when the 8A-3P in which they were flying crashed into a hill near the Huaynacocha lagoon in Junín in bad weather on October 16, 1941.

New allies; enter the 8A-5

The signing of a military aid programme between Peru and the USA in late 1941 after the latter's entry into the Second World War, and the Lend-Lease and Hemispheric Defense Co-operation Agreements signed by the two nations in the spring of 1942, opened a new chapter for Peru's military forces. The commitment of Peru to the Allied cause put strategic assets in Peruvian territory — oil refineries in Talara and raw material shipments from Callao and Chimbote harbours, for example — at risk of potential attack by Axis forces.

As a result the CAP's air units were strengthened and given new assignments; XXXI EIA was no exception, becoming an important part of the CAP's strategy for coastal defence. The unit was thus tasked with patrolling the central and northern coastal areas of the country, in order to investigate any suspected activity from Imperial Japanese Navy vessels, especially submarines.

By April 1942 XXXI EIA was back to full strength, all its aircraft having been overhauled at the *Arsenal de Aeronáutica* and returned to the unit. To comply with their newly assigned coastal duties the aircraft were painted in an overall matt Sea Blue finish. For identification purposes the leading aircraft of each escadrilla were given red or blue cowlings. The 8A-3Ps were also equipped



ABOVE Fitted with a 1,200 h.p. Wright GR-1820 Cyclone engine and machine-gun gondolas under the wings, the 8A-5 was the most powerful and heavily armed variant of the Northrop/Douglas series of attack aircraft. Norway's 8A-5s became A-33-DEs in USAAF service, an example of which is seen here at Kelly Field, where they were stored.

with a liferaft fitted on the rear canopy to increase the crew's survival chances in case of ditching.

The Douglas 8A-5 was conceived in response to a pre-war requirement issued by the Norwegian government for an A-17A powered by a 1,200 h.p. Wright R-1820-G205A Cyclone engine, to equip its *Heerens Flyvevæsen* (Army Flying Service). The result was identical to the Peruvian 8A-3P and Iraqi 8A-4 variants, but capable of carrying heavier armament in the form of a pair of Browning 0.5in-calibre machine-guns in gondolas mounted beneath the wings, raising the number of fixed weapons to six. The bombload was also increased to 1,810lb (820kg).

A total of 36 Douglas 8A-5s was ordered in early 1940 but none was delivered, the USA placing an embargo on the aircraft when Norway was finally forced to capitulate to German forces that June. A Norwegian government-in-exile was

swiftly established in the UK and its reformed air force established a training centre known as "Little Norway" at Toronto Island Airport in Canada. The 8A-5s and other aircraft purchased by the Norwegian government were sent to the base to serve as trainers. The 8A-5s served until mid-1941, when 18 of the surviving machines were repossessed by the USA as part of Reverse Lend-Lease, and pressed into USAAF service as A-33-DEs.¹² The Americans found no use for the type, however, and considered sending them to the Soviet Union; this proved fruitless and the airframes were put into storage at Kelly Field in San Antonio, Texas.¹³

Meanwhile, back in Lima, the CGA, aware of the availability of the aircraft, requested their purchase to bring XXXI EIA up to full strength, as stipulated in Peru's original strategic plan for 1939-44. Negotiations began in Washington DC

In November 1943 a total of 13 refurbished Douglas 8A-5s, along with ten Curtiss Hawk 75As, were flown from Texas to Las Palmas, where this line-up of 8A-5s was photographed shortly after their arrival in November 1943. The aircraft were apparently ferried in an Olive Drab scheme, as seen here, but were repainted in a camouflage scheme early in 1944.

AUTHOR'S COLLECTION



Although of poor quality, this rare photograph shows the overall matt Sea Blue finish applied to the 8A-3Ps from April 1942, and following this machine's assignment to the newly activated 23 EIA. Note the use of Arabic numerals instead of Roman, which were phased out in 1942.

IEHAP VIA AUTHOR



but, again, the USA's War Department opposed the sale, reasoning that the aircraft may be used against Ecuador, one of America's other Lend-Lease allies. The Peruvians restated their case in August 1941, only to be rejected again. Finally, in June 1943, with Peru firmly established as an American ally, Congress approved the transfer of 13 Douglas 8A-5 airframes to the CAP, along with two sets of propellers and five engines, under the tenets of the military aid programme.¹⁴

After several years of Royal Norwegian Air Force use and a period of storage, the surviving 8A-5s were in poor condition and, as part of the agreement, the USA committed to perform inspections and/or major repairs as necessary to the airframes before their delivery to the CAP.¹⁵ The batch of refurbished 8A-5s¹⁶ were ready for acceptance in early November 1943 and on the 16th were collected and flown to Lima by a group of officer pilots of the newly activated *No 23 Escuadrón de Información y Ataque* (23 Information & Attack Squadron — 23 EIA), along with ten Curtiss Hawk 75A-8s¹⁷ [see *Wings Over*

Peru, TAH25]. The formation flew from Kelly Field to Brownsville, and from there to Veracruz-Tapachula and on to Managua in Nicaragua, San José de David (David Field) and Rio Hato in Panama, and Cali in Colombia before arriving at Talara and then Lima on November 19, logging a total flying time of 29hr 45min.

Back to Talara

Following the arrival of the 8A-5s, 23 EIA was deployed to Capitán Victor Montes airfield in Talara, where the new aircraft were joined by the nine surviving 8A-3Ps of the recently disbanded 31 EIA. (Roman numerals had been phased out by the CAP and Arabic numerals used instead from 1942.) In early December 1943, 23 EIA achieved operational status and began performing maritime patrol duties along the northern Peruvian coastline, in co-operation with USAAF units stationed at the nearby El Pato airbase.¹⁸

In early 1944 the 8A-5s of 23 EIA were sent to the Arsenal de Aeronáutica for inspection, and were painted in a new Dark Green, Dark Earth

BELOW Another rare image, this time of 8A-3Ps at Capitán Victor Montes airfield near Talara, in December 1942. These 8A-3Ps have not yet been painted in the Sea Blue finish; the aircraft were repainted in batches so as not to remove the entire unit from service at once. All had been repainted by the time of the arrival of the 8A-5s, however.

AUTHOR'S COLLECTION



Showing the 8A-5's armament of four 0.3in machine-guns within the wings, a pair of underwing gondolas each containing a 0.5in machine-gun, plus a 0.3in machine-gun on a flexible mount in the observer's cockpit, this example is seen in the Dark Green, Dark Earth and Light Gray camouflage scheme applied from early 1944, and with a squadron badge below the front cockpit.

DIRIN VIAAUTHOR



and Light Gray colour scheme — differentiating them from the 8A-3Ps, which retained their dark-blue overall finish — for the rest of the war.

With the end of the Second World War came the end of the economic and military aid given by the USA to its “backyard allies”, including Peru. As a result, the Peruvian *Ministerio de Aeronáutica* (Air Ministry — MA) was forced to realign the CAP's size and structure with its peacetime requirements. Thus 23 EIA was disbanded in January 1946 and its aircraft transferred to the simultaneously reactivated 31 EIA based at Lima, which operated a mixture of 8A-3Ps and 8A-5s. Also, during this period a new serial system was adopted, as follows:

- 100-series serials — fighters;
- 200-series — fighter-bombers and ground-attack aircraft;
- 300-series — transport aircraft;
- 400-series — training aircraft;
- 500-series — miscellaneous types;
- 600-series — helicopters;
- 700-series — liaison aircraft.

The 8A-3Ps and 8A-5s, given 200-series serials as fighter-bombers, reverted to a natural-metal finish with a coloured band applied to the rear fuselage, in which the letters A, B or C were applied for identification purposes.

The 1948 uprisings

On July 4, 1948, disaffected Peruvian Army officer Cmdr Alfonso Llosa González Pavón led a right-wing rebellion against the President, Dr José Luis Bustamante y Rivero. The government swiftly ordered the CAP to take action. During the early hours of July 5 the *Comando de Operaciones* (Operations Command — COMOP),

under the direct command of the MA, ordered the deployment of three 31 EIA Douglas 8As and a pair of Curtiss-Wright CW-22B monoplane trainers of No 35 *Escuadrón de Información Terrestre* to Alfredo Rodríguez Ballón airport in Arequipa in southern Peru. After a 2½hr flight from Las Palmas to Arequipa, Cmdr Luis Cayo Murillo performed a reconnaissance sortie over the city of Juliaca, after which he issued a complete report to the head of the Army's *IV Región Militar*. Following radio communications with COMOP in Lima, Cayo received the order to attack the rebel forces.

At 1510hr on July 5 the three 8As took off from Alfredo Rodríguez Ballón with Capt Jorge Camell del Solar as flight leader and Capt Jorge Barbosa Falconí and 2nd Lt Pedro Izquierdo Kernan as his wingmen. Engine failure forced Camell and Izquierdo to abort the sortie and land at Cuzco, the alternate airfield, while Barbosa continued on to Juliaca, attacking the army barracks with bombs and machine-gun fire. After running out of ammunition Barbosa headed back to Arequipa, but became disoriented by the sun in his eyes. Unable to determine his position and with fuel levels decreasing alarmingly, a nervous Barbosa decided to return to Cuzco using geographical landmarks as references, managing to land at the former capital of the Inca empire with the day's last sunrays.

Three months later the 8As were back in action during the so-called *Rebelión de la Armada*, an attempted coup led by *Marina de Guerra del Perú* (Peruvian Navy — MGP) elements disaffected with the government, which started on October 3, 1948. With the main MGP bases and the bulk of the fleet captured by the insurgents, the CAP,



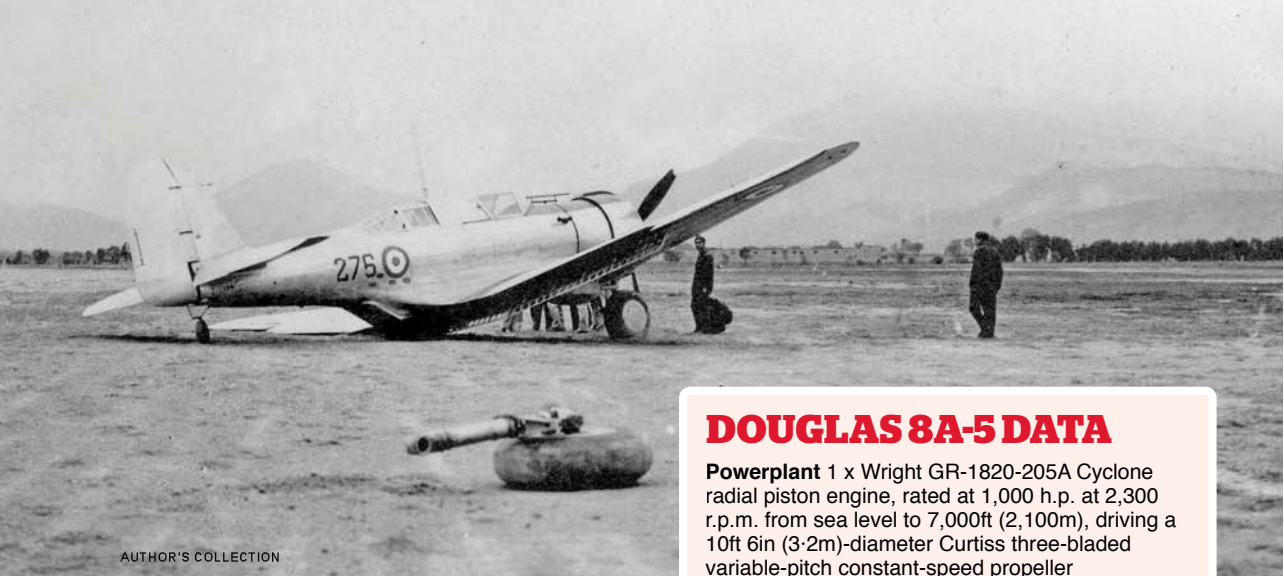
ABOVE Douglas 8A-5 serial 276 at Las Palmas in the late 1940s, by which time markings were minimal, with a small roundel aft of the cockpit and the aircraft's 200-series serial aft of that. Like the rest of the aircraft (apart from the black anti-glare panel on the forward fuselage), the rudder is bare-metal and no longer sports the original red, white and red stripes.



LEFT With the rear cowling of its Wright Cyclone engine removed, 8A-5 serial 266 of the re-formed 31 EIA undergoes maintenance at Vitor, Arequipa province, in February 1948. The year would prove to be another busy one for the CAP's 8As, with operations in support of the government to extinguish a right-wing rebellion in July and two more attempts to overthrow the government in October, the last of which was successful.

BELOW President Bustamante y Rivero reviews the aircraft and personnel of 31 EIA on October 6, 1948, after their participation in action against rebel sailors of the Peruvian Navy during the "October Revolution" of October 3-5. Before the month was out, the President had been ousted in a coup led by Army General Manuel Odria. IEHAP VIA AUTHOR





AUTHOR'S COLLECTION

ABOVE Having deposited its port mainwheel on the runway after a particularly heavy landing at Las Palmas, 8A-5 serial 276 is inspected by 31 EIA personnel. The damage was deemed to be minimal and the aircraft was swiftly repaired and returned to service within a few days. The type proved itself to be a rugged and dependable asset for the CAP.

which remained loyal to the government, was ordered to launch attacks against the rebel forces. The task fell to 31 EIA, and a seven-aircraft formation took off from Las Palmas at 0945hr on October 3 to attack the rebel fleet facing the Miraflores, Barranco and Chorrillos districts of Lima. The formation leader instructed his men to perform mock dive-bombing attacks over the ships to persuade their crews to surrender; but, as the first aircraft approached, dozens of anti-aircraft guns opened fire against the formation, although none of the aircraft was hit.

After returning to Las Palmas the unit awaited fresh orders, departing again at 1130hr to attack the fleet flagship *BAP Almirante Grau*, which was refuelling at the naval base in Callao harbour. After arriving over their objective, the 8As began their bombing runs into a barrage of anti-aircraft fire from the ship; all received hits, although none was critical. After completing their sortie, the 8As returned to Las Palmas, where inspection by ground personnel revealed bullet hits on every aircraft, with 8A serial 277, flown by 2nd Lt Bohórquez, being the worst-hit, having landed with a flat tyre owing to bullet damage.

A third sortie was launched at 1700hr. Three 8As, led by Capt Barbosa, departed to attack rebel vessels sighted off San Lorenzo Island, near Callao. After discovering their targets, the aircraft each dropped four 110lb (50kg) bombs in salvoes, achieving some near-misses and damaging some of the ships. By the end of the day, after thousands of civilian and military casualties, the "October Revolution" had lost its momentum and by nightfall most of the fighting had ceased, the rebel fleet returning to Callao harbour to surrender.

DOUGLAS 8A-5 DATA

Powerplant 1 x Wright GR-1820-205A Cyclone radial piston engine, rated at 1,000 h.p. at 2,300 r.p.m. from sea level to 7,000ft (2,100m), driving a 10ft 6in (3.2m)-diameter Curtiss three-bladed variable-pitch constant-speed propeller

Dimensions

Span	47ft 8¾in	(14.55m)
Length	32ft 6in	(9.9m)
Height		
Thrust-line level (tll)	12ft 6in	(3.3m)
Tail down	10ft 0in	(3.05m)
Tailplane span	17ft 7in	(5.4m)
Tailplane area	35.8ft²	(3.3m²)
Fin area	9.7ft²	(0.9m²)
Propeller-tip clearance (with tll)	8½in	(20.6cm)
Wheel track	11ft 0in	(3.35m)

Wing

Area	363ft²	(33.7m²)
Chord		
MAC*	96.9in	(246cm)
Maximum	114in	(289.5cm)
Aerofoil section		
Root	NACA 2415	
Tip	NACA 2409	
Dihedral	5.5°	
Incidence	2.5°	
Sweep	5°	
Flap area, total	49.8ft²	(4.6m²)

Weights

Empty	4,874lb	(2,211kg)
Loaded		
Attack sortie	7,500lb	(3,402kg)
Bombing sortie	8,600lb	(3,900kg)

Performance

Maximum speed		
at sea level	208 m.p.h.	(335km/h)
at 8,700ft (2,650m)	238 m.p.h.	(383km/h)
Landing speed	66 m.p.h.	(106km/h)
Climb	1,200ft/min	(370m/min)
Service ceiling	24,000ft	(7,300m)
Maximum range	1,180 miles	(1,900km)

Armament

4 x fixed forward-firing 0.3in machine-guns;
2 x 0.5in machine-guns in wing-mounted gondolas;
1 x 0.3in machine-gun on flexible mount in observer's position

Bombload	up to 2,205lb	(1,000kg)
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* Mean aerodynamic chord

1 The CTA was an ad-hoc outfit comprising three officers designated by the CGA

2 In compliance with the terms of a 1936 contract signed between the Peruvian government and Caproni, the former committed to give the Italian company the first purchase option on any future CAP aircraft unless their performance characteristics or price could be bettered by the competition

3 The CAP's operational requirements for 1939–44 stipulated sufficient aircraft to equip two squadrons, comprising three escadrilles of three aircraft each, plus one reserve aircraft

4 There were concerns in Washington DC regarding the sale of military hardware to a government deemed to be sympathetic to fascism, as the administration of Gen Oscar R. Benavides was

5 Douglas 8A was the designation given to export versions of the A-17

6 The M1919 was modified to fire 7.65mm-calibre ammunition on the Peruvian machines

7 These aircraft were given the civil registrations BO-1G to BO-3G

8 The replacement wing arrived tied to the undersurface of a CAP Curtiss BT-32 Condor

9 The TON was an ad-hoc arrangement of aerial,

ground and naval forces created in January 1941 to protect Peru's northern territories

10 The *Acuerdo de Talara* was a first step towards the definitive peace agreement, the *Protocolo de Paz, Amistad y Límites de Río de Janeiro*, signed in Rio on January 29, 1942

11 *Arsenal de Aeronáutica* was the name given to the former Caproni works at Las Palmas after its expropriation in the summer of 1941

12 A-33DE; this followed the USAAF-type designation system (A = Attack)

13 These aircraft had the USAAF serials 42-13584 to 42-13601

14 An additional airframe was eventually sent to Peru as an attrition replacement, raising the total number of 8A-5Ns delivered to the CAP to 14

15 This included the provision of new engines

16 This batch of refurbished aircraft received new USAAF serials for record-keeping purposes, running from 42-109007 to 42-109019

17 This was part of a total of 28 aircraft purchased as part of the Lend-Lease programme in 1942

18 El Pato was an airbase built by the American government in accordance with the defence agreement signed between the USA and Peru on April 24, 1942

Within a month of the bloody conclusion to this attempted revolution, the Peruvian government faced yet another uprising.

The final act

On October 27, 1948, Army Division General Manuel A. Odría broadcast a manifesto from Arequipa, calling for an insurrection against the Bustamante y Rivero government. In Lima 31 EIA was again called into action, with two escadrilles, authorised to use lethal force if necessary, deploying to Arequipa to contain the rebel forces. However, unbeknown to the 8As' crews, the coup successfully removed the government during the unit's flight. As the pilots climbed out of their machines after landing at Arequipa, armed

guards rounded them up and placed them in custody. The local CAP commander ordered the removal of all bombs and ammunition from the six aircraft pending further orders, which arrived a few hours later. In a twist of destiny, the recently released pilots found themselves escorting the C-47 carrying Gen Odría and his staff to Lima.

More than 15 years of wear-and-tear in service, along with a chronic lack of spares, meant the progressive reduction of the 8A fleet. Only a few remained airworthy by the beginning of the 1950s, and in early 1958 the story of the Douglas 8A in Peru finally came to its final chapter, when all remaining examples were withdrawn from service, the type having provided sterling service for nearly two decades.



BELOW Douglas 8As of 31 EIA taxi out for take-off at Teniente Coronel Pedro Ruiz Gallo airport in Chiclayo in July 1947. For comprehensive information on Guerra del 41, see the author's Air Wars Between Ecuador and Peru, Volume 1: The July 1941 War (Helion & Company), reviewed in this issue's Books in Brief section on page 122.

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DIRTY SECRETS

CHEMICAL WARFARE EXPERIMENTS IN THE SOVIET UNION

Although the development of the aeroplane led with depressing inevitability to the concept of delivering poisonous gas and chemicals on enemy troops from above, the practice was banned by international treaty in 1925. Germany and the Soviet Union, however, collaborated on top secret airborne chemical warfare research, as **LENNART ANDERSSON** reveals

THE PROTOCOL for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases and of Bacteriological Methods of Warfare — usually called the Geneva Protocol — was signed in the Swiss city by many countries on June 17, 1925, and entered into force on February 8, 1928. Nevertheless, in the 1920s and 1930s several countries experimented with the diffusion of poisonous chemical substances from aircraft, and its use as a weapon. For some, this was part of preparations for defence against a chemical attack. In other countries, including Germany and the Soviet Union, the testing and development of equipment was oriented towards offensive use. While the former was a signatory to the Geneva Protocol, the Soviet Union was

not, although it had ratified it in 1928. The Soviet Union's interpretation was that it was a "no-first-use" treaty that did not ban the development and/or stockpiling of chemical weapons for use in retaliation. The presence of chemical weapons in the Red Army was never officially recognised, however, and was considered top secret.

A SECRET AGREEMENT

Although poison gas was on the list of weapons that Germany was not allowed to possess according to the Versailles Treaty, which went into force in 1920, it was one of the first types of offensive aircraft armament secretly developed there in the 1920s. Disguised as a private venture in the field of pest extermination, gas bombs and the development of equipment for gas diffusion



from aircraft were being designed and tested in Germany. Junkers all-metal aircraft were deemed best suited for the purpose because of the greater ease of decontaminating them after use.

On January 23, 1925, the German Defence Ministry signed a secret agreement with Junkers and Hugo Stoltzenberg's Hamburg-based *Chemische Fabrik Stoltzenberg*, then establishing a factory for the synthetic production of mustard gas, Bersol, at Ivashchenkovo in the south-west of the Soviet Union. The factory proved to be a failure, however, and was later closed.

Flight tests with Junkers-F 13 D-507 were made secretly at Rossitten in Germany (now Rybachy in Russia's Kaliningrad exclave) during May–November 1925. Equipment developed and tested included 200lit (44 Imp gal) and 300lit (66gal) tipping containers; a 250lit (55gal) low-pressure tank; 0.9lit (0.2gal) to 5lit (1.1gal) gas bombs or glass ampoules, and 2lit (0.4gal) to 60lit (13gal) bombs made of metal. From February 1926 the *Gesellschaft für landwirtschaftliche Artikel mbH* (Gela) company was used as a cover for these activities, and it was decided to conduct all further practical experiments in the Soviet Union in order not to compromise security.

A suitable location for the experiments was found at Podosinki, 15 miles (25km) south-east of Moscow, where Ukhtomskaya airfield, a chemical plant and a testing ground already existed. That the facility was situated close to some inhabited villages was not regarded as a problem, as the Soviet authorities had promised to take responsibility for damages caused during the experiments.

Accordingly, a 12-strong German team was despatched, headed by engineer and pilot Hans Hackmack (cover name "Amberg"), and included pilot Friedrich Mühlhan and poison-gas and bomb specialist Ernst Marquard, also a pilot. By August 1926 Junkers-A 20 registration D-719 and

two F 13s (D-251 and D-831) had been transferred from Germany with all markings carefully deleted to make identification impossible if observed by outsiders. Flying started late in September and the main tests were completed during November–December. A new type of spraying container, the S 125, was tested and declared suitable and ready for mass production.

▲ TEMPORARY HALT

In May 1927 the German Foreign Ministry demanded that all tests of this type be suspended owing to political considerations, and the three aircraft were sent back to Germany. This was only a temporary measure, however, and in March 1928 a new test site was found at Prichernavskaya (Shikhany), near Volsk, on the right bank of the Volga, where a specialised joint German-Soviet poison-gas experimental centre was established. It was assigned the cover name "Tomka" by the Germans. The firm Müggenburg GmbH had by this point taken over from *Chemische Fabrik Stoltzenberg* and became the main supplier of poison-gas chemicals. On March 31, 1928, Firma Schulz & Co, Motoren- und Maschinen GmbH, Berlin — another cover organisation created for the poison-gas experiments — was liquidated; Gela suffered the same fate on June 30 that year. The reason was probably that these names had been compromised. However, a secret test laboratory was built up at Tomka under the guise of an automobile factory belonging to Siemens.

In mid-July 1928 F 13 D-251 and Heinkel HD 40 II D-1180 were flown to Tomka, A 20 D-719 later joining them. The HD 40 had been ordered in March 1927 by the Schulz company especially for poison-gas and bombing tests. The Tomka site continued to operate until August 1933, but little is known about the activities there during 1930–33. A 200lit time-fuzed bomb which exploded at 200m–300m (650ft–980ft) when dropped from

OPPOSITE PAGE, TOP *Although of poor quality, this rare photograph shows Junkers-F 13 D-507 undergoing secret airborne chemical warfare tests at Rossitten in German East Prussia in 1925. BELOW* *Another extremely rare photograph, this time showing Junkers-A 35 D-719 (right), with all markings removed, and an F 13 at Podosinki circa 1926–27.*

ALL ILLUSTRATIONS VIA AUTHOR





Junkers-F 13 D-251 (minus hyphen in this photograph) was used by the Germans for poison-gas tests in the Soviet Union from 1926. Like many aircraft secretly owned by the German military, D-251 was registered to the Deutsche Versuchsanstalt für Luftfahrt (DVL — German Aviation Research Institute).

RIGHT After its withdrawal from airborne poison-gas testing with D-251 at Podosinki during 1926–27, Junkers-F 13 D-831 was used by the DVL for trials with experimental tail surfaces, as seen here, to explore methods of reducing control forces. It was later registered to the Reichsverband der Deutschen Luftfahrtindustrie (RDL — National Association of the German Aviation Industry).



BELOW Suitably remote, Rossitten, now Rybachy on the Russian side of the Curonian Spit between the Curonian Lagoon and the Baltic Sea, close to the border with modern-day Lithuania, was used for poison-gas tests in 1925. By the mid-1920s the dunes at Rossitten had become very popular with Germany's burgeoning glider community.





ABOVE The third Heinkel HD 40 single-engined transport/light bomber, HD 40 II D-1180, was acquired in 1927 specifically for poison-gas and chemical warfare trials. Registered to the DVL, it was ordered through the offices of Firma Schulz & Co of Berlin, one of the various cover organisations created for chemical warfare experiments.

4,000m (13,000ft) was developed, along with a 65kg (143lb) mustard-gas bomb and the S 200 and S 300 spray containers, but otherwise work seems to have been concentrated on the chemical and physical aspects of gas warfare.

ENTER OSOAVIAKHIM

Meanwhile, the development of both biological and chemical weapons for the Red Army had started. The Military Chemical Administration, led by chemist Yakov Fishman, had been formed in 1925 as the main authority responsible for biological and chemical warfare preparedness. In January 1927 the *Obshchestvo sodeistviya oborone, aviatsii i khimicheskomy stroitel'stvu* (Osoaviakhim — Union of Societies of Assistance to Defence & Aviation-Chemical Construction) was formed as a support agency for aviation and chemical defence projects, absorbing the previous Aviakhim organisation. It was a large group that had sections in most of the larger cities in the Soviet Union. Little had been done in the form of practical development, however, and in 1928 Fishman recommended to Soviet military leaders that an offensive biological- and chemical-warfare programme be organised. Scientists started to evaluate a wide range of bacteria for this purpose and, reportedly, prison camp inmates were used as test subjects.

So-called “pouring aerial devices” (*vylivnye aviatsionnye pribory* — VAP) were developed for

the spraying of gas from aircraft of the *Voenno-vozdushnye sily* (VVS — Soviet Air Force) and in March 1928 unsuccessful experiments were undertaken at Podosinki with the Soviet-designed VAP-2 spraying container fitted to an R-1 (a Soviet-built de Havilland D.H.9A copy). The improved VAP-3 was tested on R-1s of the *56th aviaeskadrilya* at Gornostayevsk in September 1929, but its opening mechanism was found to be too unreliable. The next version of this device, the VAP-4 with a capacity of 82lit (18gal), was then developed and accepted for series production in December 1930. The following year the first 500 examples were built by the Vulkan factory, later designated *Zavod* (Factory) No 145. The R-1 could carry two VAP-4s and the R-1's successor, the Polikarpov R-5, could carry four.

Other aircraft types were also modified to carry the VAP-4, and it is known that it was tested on an MBR-4 (Soviet-built Savoia-Marchetti S.62bis flying-boat) and a twin-engined Tupolev R-6, and even on a Kamov A-7 autogyro. Chemical warfare was soon considered a normal component of airpower in the Soviet Union, and in addition to developing various types of VAP and *dymovye aviatsionnye pribory* (DAP — smoke aerial devices) for all standard types of aircraft, attempts were made to design a specialised chemical warfare aircraft. This was the Putilov Kh-1 (Stal-5), fitted with two Mikulin M-34 engines. It was designed to be able to carry 200kg (440lb) of chemicals, but



"IN JULY 1937 A LINE OF AIRCRAFT AT A FLIGHT SCHOOL WAS SPRAYED WITH NON-LETHAL TRAINING CHEMICAL AGENT ... 30 CADETS, INSTRUCTORS AND TECHNICIANS HAD TO BE SENT TO HOSPITAL WITH BURNS ..."

ABOVE LEFT *The ABK-1 "ampoule-bomb cartridge" was one example of the many types of chemical warfare devices developed in the Soviet Union in the inter-war period. Here rows of ABK-1s await delivery at Zavod (Factory) No 145 in Moscow, where they were produced in substantial numbers.*



LEFT *A pair of VAP-4m containers fitted to the lower port wing of a Polikarpov R-5SSS, often referred to simply as SSS (skorostnoi skoropodemnoi skorostrelnyi — high-speed, fast-climbing aircraft), which was a specialised ground-attack variant of the R-5. The VAP-4m was accepted for service from 1936.*

in peacetime was to be operated by Aeroflot as a passenger transport. It was developed in project form at Tushino-based Zavod No 81 during 1933–35, but was eventually cancelled. Even when the Sukhoi ANT-25 (RD) long-distance record aircraft was being designed, it was suggested that it should be adapted to carry four to five tons of liquid poison gas in its tanks.

In October 1935 the modified VAP-4m was tested by the NII-VVS (Scientific Test Institute of the VVS), responsible for all state acceptance tests of military aircraft and aviation equipment. Further testing was undertaken at the Shikhany centre, which the Soviets designated the *Tsentralnyi voenno-khimicheskii poligon* (Central Military Chemical Range), which had targets in the form of houses, and live animals were used to study the effects of the gas. When the Germans had evacuated the facility in August 1933, all buildings, including a chemical laboratory, workshops with equipment, machines and tools,

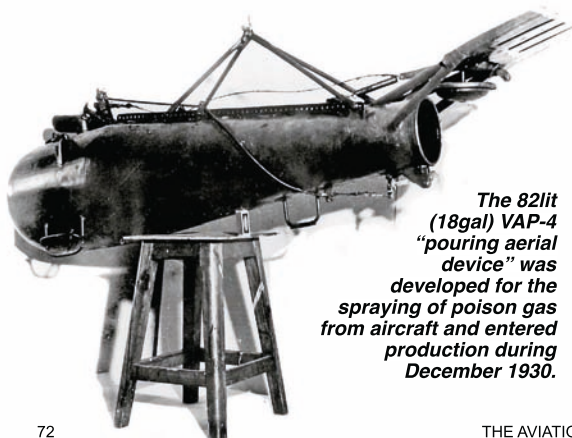
filling and power stations, cars and trucks were transferred free of charge to the Soviet Union.

Tests that involved aircraft were normally performed by the 36th Detached Squadron, earmarked for the chemical role. This unit was formed at Prichernavskaya with the R-1, soon replaced by the Polikarpov R-5, and the unit also operated at least one twin-engined Tupolev TB-1 bomber, perhaps temporarily. The VAP-4m was accepted for series production, and from 1936 it was part of the armament of the Polikarpov R-5 and R-Zet, Beriev MBR-2 flying-boat, Ilyushin DB-3 (Il-4) twin-engined monoplane bomber and other types. The larger VAP-5 was tested in 1933, but its development was cancelled. The VAP-6, smaller and intended for fighter aircraft, was produced by Zavod No 145 for the Polikarpov I-15, I-15bis, I-153 and I-16 fighters.

For the Tupolev TB-3 bomber the much larger VAP-K-6 was developed, followed by the VAP-500 and VAP-1000. The latter pair had a capacity of 315lit (69gal) and 705lit (155gal) respectively, and were produced in quantity for the Ilyushin DB-3 and Tupolev SB and TB-3 bombers.

INTO THE INVENTORY

During 1939–40 the 138lit (30gal) VAP-200 was produced for the Kochyerigin BSh-1 (Soviet-built Vultee V-11GB), Sukhoi BB-2 (Su-2) and Ilyushin BSh-2 (Il-2) attack aircraft. The UKhAP-250 and UKhAP-500 dispensers used exploding powder to discharge chemicals, and KhAB-25 and KhAB-200 gas bombs were also produced. Cassettes with small glass or metal ampoules filled with liquid gas that broke on impact with the ground were tested with varying results, and it was only in the



The 82lit (18gal) VAP-4 "pouring aerial device" was developed for the spraying of poison gas from aircraft and entered production during December 1930.



years preceding the German attack in June 1941 that series production of such equipment started.

By 1933 the R-5Sh attack variant equipped one squadron each of the 251st, 252nd and 255th Brigades, and from 1934 each three-squadron aviaeskadrilya belonging to these brigades had one squadron equipped with the VAP-4. Prospective plans included mass attacks by R-5s, and it was intended to use gas against infantry, cavalry, artillery and horse-drawn carts, which were considered particularly vulnerable. Theoretically, each aircraft could carry four VAP-4 containers, and one air brigade of 100 aircraft flying at 50m (160ft) could discharge a total of 4,500kg (9,900lb) of mustard gas in one mission.

Although the material prerequisites existed, there were, however, problems when it came to preparations in earnest for chemical war, as it was difficult to arrange the storage of the chemicals and the adequate protection of personnel. Open-cockpit types like the R-1 and R-5 were not

ABOVE In 1936 a Tupolev TB-3 M-34RN was equipped as a flying laboratory (TB-3LL) for Soviet chemical warfare research, and cleared the use of the VAP-500, as seen here fitted to the belly of a TB-3. Perhaps surprisingly, battlefield chemical warfare was never used by the Soviets (or Germans), even at the brutal height of the Second World War.

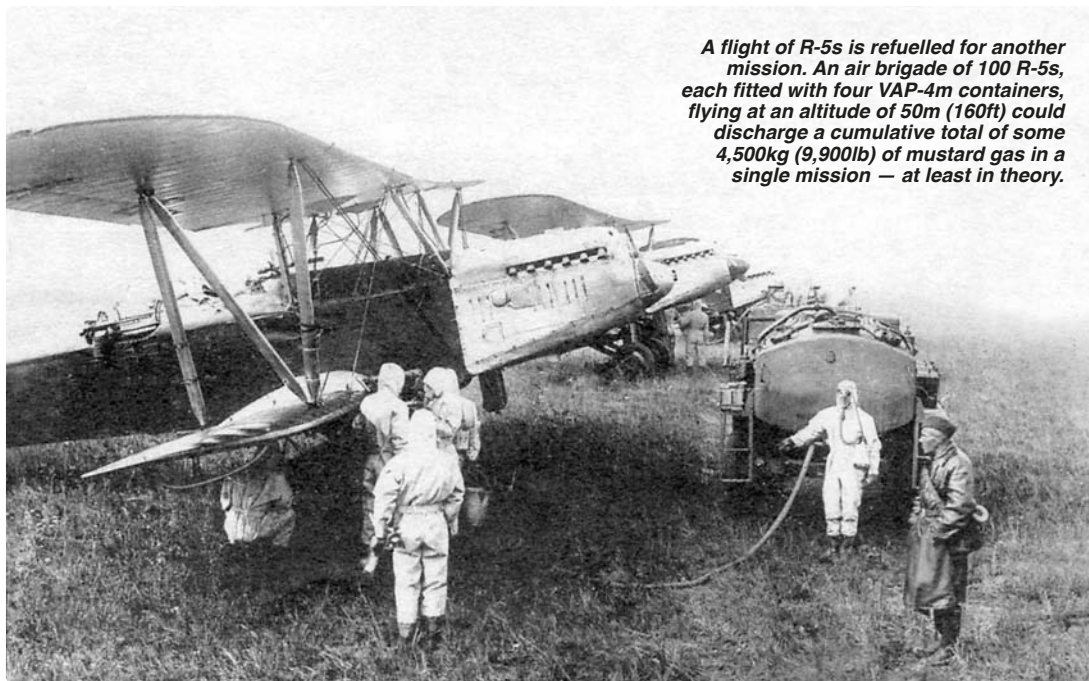
really suited to the role and most personnel were not trained to handle dangerous chemicals.

There were numerous accidents. On July 29, 1937, owing to a navigational error, a line of aircraft at a flight school was sprayed with non-lethal training chemical agent; about 30 cadets, instructors and technicians were sent to hospital with burns and the aircraft required repair. The pilots responsible were punished for "sabotage". In reality, attacking enemy troops with gas, flying long distances at 50m (160ft) would have involved a great risk of being hit by groundfire. Unsurprisingly, exercises with dangerous chemicals were not popular among VVS personnel.

In the early 1930s the Polikarpov R-5 replaced the R-1, essentially a Soviet-built de Havilland D.H.4. The R-5 could carry four VAP-4 gas containers, as seen on the aircraft nearest to the camera in this photograph.



A flight of R-5s is refuelled for another mission. An air brigade of 100 R-5s, each fitted with four VAP-4m containers, flying at an altitude of 50m (160ft) could discharge a cumulative total of some 4,500kg (9,900lb) of mustard gas in a single mission — at least in theory.

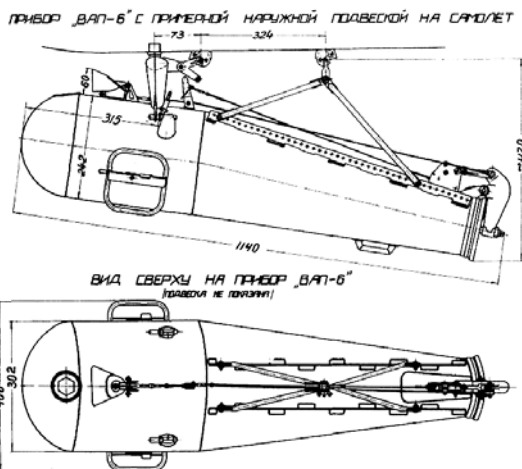


In August 1939 a series of tests was conducted with an Ilyushin DB-3B, to evaluate both the efficiency of the VAP-500 spraying device and the safety of chemical warfare operation for the crew. The assortment of bombs that the type could carry included, in addition to ampoule cassettes, AOKh-10, KhAB-200, KhAB-500 and KhAB-1000 chemical bombs. Personnel were taught how to handle the bombs and the VAP-500 at special training grounds, where real chemical-warfare agents (a solution of mustard-lewisite in kerosene) were used. Before a sortie, all openings in the lower surface of the bomber's fuselage had to be sealed and the gas was to be released in straight and level flight only. After each flight the entire rear of the aircraft had to be decontaminated.

THE POLITICAL BRAKE

Did the VVS ever use its stocks of poison gas in war? The answer seems to be no, but several times during the Red Army's 1930s local conflicts its commanders were reportedly ready to employ chemical weapons, but were held back for political reasons. There were such plans for the Soviet invasion of eastern Poland in mid-September 1939 and during the Winter War with Finland during 1939–40, but those conflicts ended before the necessary preparations could be completed.

By the beginning of the war in Europe, the VVS possessed a large number of aircraft capable of carrying devices for gas spraying. Special equipment for refuelling and degassing had been developed and there was a certain amount of trained personnel. Thankfully, no country employed poisonous gas during the war, including the Soviet Union, not even when



ABOVE The VAP-6 container was produced for fighter aircraft, and was fitted and tested on the Polikarpov I-15, I-15bis, I-153 biplanes and I-16 monoplane.

the German war machine destroyed cities, killed thousands of civilians and forced the Red Army to retreat almost all the way to Moscow in 1941.

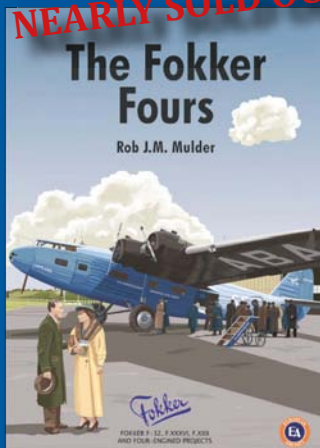
It may have been the risk of similar retaliation, the inherent danger of such methods for one's own personnel, purely practical problems or something else entirely that prevented such warfare. Could it be that even cruel and ruthless dictators like Hitler and Stalin realised the horror of such ghastly methods, hesitated, and ultimately decided to refrain from using them? It certainly seems unlikely, particularly in light of Hitler's grotesque actions — but we shall almost certainly never know.



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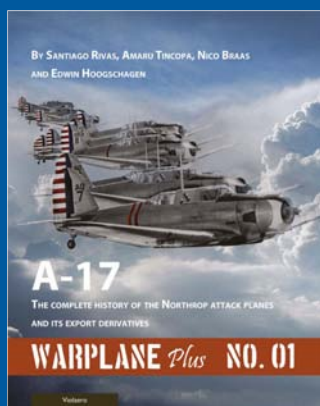
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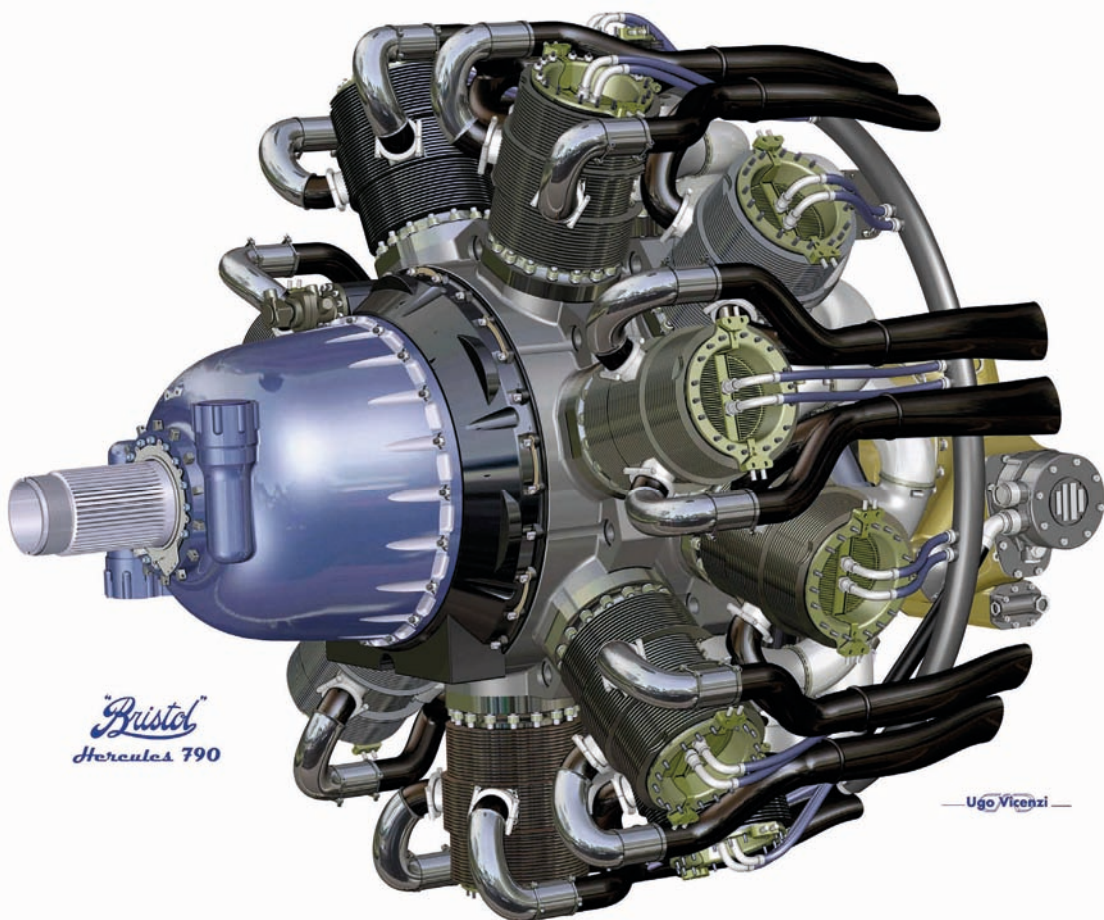
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With the help of his own CAD illustrations, **UGO VICENZI** describes the genesis of the sleeve-valve concept, its development and the anatomy of the dazzlingly complex Hercules

PERHAPS NOT ALL the fans who watch the spectacular displays of the *Association Noratlas de Provence's* airworthy example of the Nord 2501 twin-engined transport, F-AZVM, realise that the somewhat different exhaust note of its engines is not coming from just another 14-cylinder radial piston engine. It comes from one of the very last examples of an outstanding family of powerplants representing a highpoint of British mechanical engineering. The Bristol Hercules and its bigger brother, the Centaurus, were not the only engines to incorporate the sleeve-valve

concept, but they were the most successful examples of the mechanical innovation that replaced the traditional poppet-valves — present in all four-stroke engines — with a sleeve located between the piston and the cylinder, acting at the same time as cylinder-liner and distribution device for fuel/air inlet and exhaust.

Why conventional poppet-valve engines are more manageable becomes readily understandable when one starts discovering the peculiar mechanism needed to operate the innovative distribution system introduced with the sleeve-valve. The latter represented a technology that required extremely precise

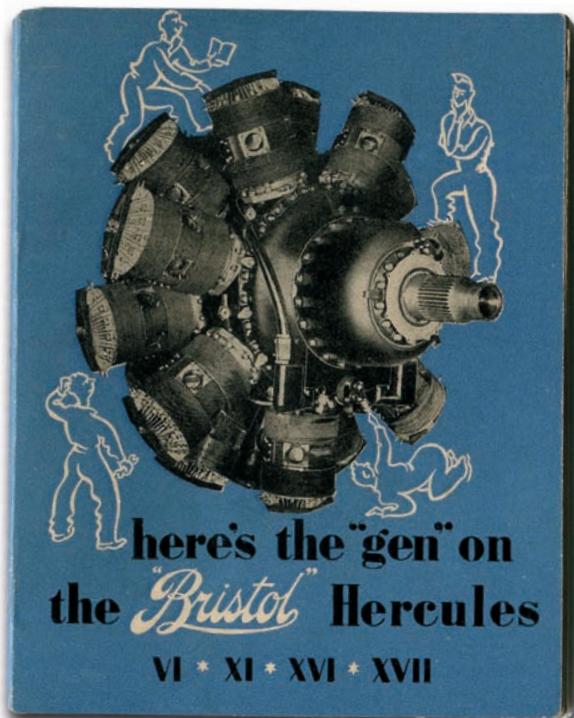
manufacturing, with incredibly tight tolerances between parts and which chalked up a number of failed engine projects. Indeed, of all the sleeve-valve engine designs, only two managed to establish a level of working reliability and reasonable time between overhauls — the Centaurus and the Hercules.

A new direction

To discover the reason behind trying a different way to allow fresh air/fuel mixture to enter the cylinder, and correspondingly to have the exhaust gases leave the combustion chamber (so-called “distribution”), we must go back in piston-engine history to the 1920s, when the limitations of the traditional poppet-valve system began to be revealed and investigated. Even in the early 1930s a 1,000 h.p. aero-engine was still mostly on the drawing boards or in the dreams of engineers, but in the search for higher power output it was necessary to have higher engine speeds (r.p.m.) — a target difficult to achieve with the traditional system of cams and pushrods operating the valves.

A second limiting factor was the extremely harsh environment inside the combustion chambers, which tended to damage the exhaust valve exposed to the ultra-hot torrent of exhaust gases. A high valve temperature reduces the latter’s life and causes problems with the valve-liners, which become distorted and cannot remain gastight. Above all, it is a main cause of detonation, the effect appearing as the violent hammering that is felt when the mixture explodes during the compression phase before the ignition spark does its job. A detonating engine does not survive for long. Yet another consideration is that conventional valves occupy a substantial part of the combustion chamber, which therefore cannot be designed to have the perfect shape for smooth burning of the mixture.

These considerations occupied the mind of engineer Roy (later Sir Roy) Fedden, who joined Bristol in 1920 after having designed the successful Mercury engine for Brazil-Straker, which became part of Cosmos Engineering in 1919. The following year Bristol in turn acquired the assets of Cosmos, including Fedden, and continued engine production in the company’s new plant at Filton. Looking for new ways of obtaining higher performance from aero-engines, Fedden started work on the sleeve-valve concept. This was a way to control the inlet and exhaust of the cylinder via a sleeve which was co-axial

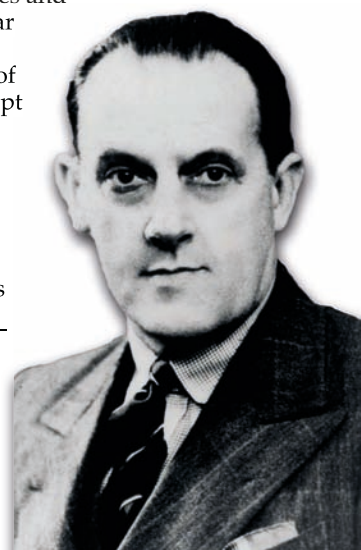


COLIN HIGGS COLLECTION

with the cylinder barrel and the piston, moving on a helical path. The sleeve was perforated by specially-shaped apertures which, as it moved, lined up with apertures in the cylinder to create momentarily-open paths for inlet and exhaust without the need for poppet-valves.

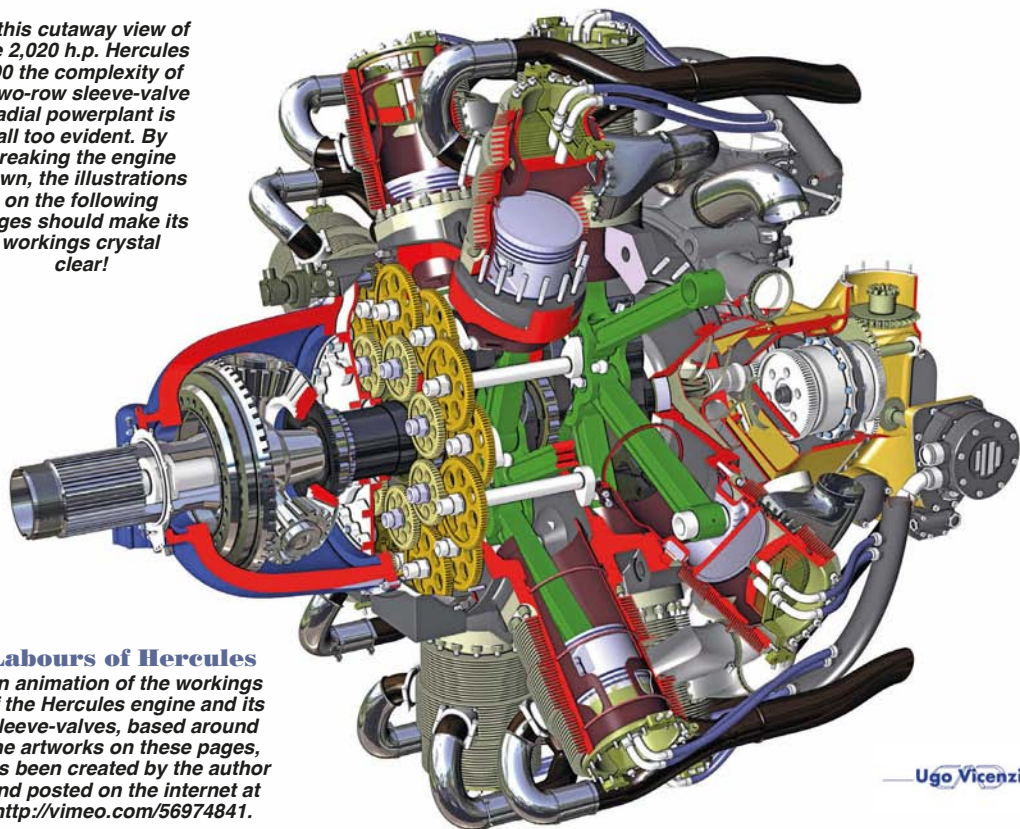
At this point two different sleeve-valve concepts had evolved. One used two co-axial sleeves, patented by the American Charles Knight. The other, co-patented in 1909 by Scotsman Peter Burt and Canadian James Harry Keighly McCollum, employed only a single sleeve. The two-sleeve system was used in car engines by Daimler, Panhard and others, but was never extensively developed. The single-sleeve principle was also incorporated into automobile engines and used by the Scottish car manufacturer Argyll.

Another advantage of the sleeve-valve concept was that the shape of the combustion chamber allowed the engine to work with fuel of a lower octane number at the same compression ratio; this



OPPOSITE PAGE A true work of art — the Bristol Hercules 790, as rendered in CAD by the author. **TOP RIGHT** A contemporary Bristol Hercules brochure. **RIGHT** Sir Albert Roy Hugh Fedden MBE was born in Bristol on June 6, 1885, and went on to become one of Britain’s most influential engine designers.

In this cutaway view of the 2,020 h.p. Hercules 790 the complexity of a two-row sleeve-valve radial powerplant is all too evident. By breaking the engine down, the illustrations on the following pages should make its workings crystal clear!



Labours of Hercules

An animation of the workings of the Hercules engine and its sleeve-valves, based around the artworks on these pages, has been created by the author and posted on the internet at <http://vimeo.com/56974841>.

translated into generating greater power from the same type of fuel, or allowing a higher super-charger pressure, with the advantage of lower fuel consumption. There is no such thing as a “free lunch” of course, and issues arose in maintaining a consistent lubricating film between the sleeve, cylinder and piston.

Making progress

In 1925 Royal Aircraft Establishment (RAE) engine specialist Harry Ricardo (Sir Harry from 1948) published *The High-Speed Internal Combustion Engine*, in which he pointed out that the traditional poppet-valve engine was reaching the limits of its development and that another way of regulating the gas flow in the engine was needed. Ricardo was already influential and his work attracted much attention from innovative engineers such as Fedden. The descendant of the company founded by Ricardo in 1915 remains active today, providing consultancy on transport, defence and clean-energy issues.

Impressed by the Burt-McCollum concept, Fedden made the decision to adopt the idea for his own engines in 1926, when the patent was on the verge of expiring. By late 1927 Fedden and Harvey Mansell had built and run a two-cylinder Vee-arrangement air-cooled sleeve-valve engine as a test article for a 12-cylinder inverted-vee mono-sleeve engine of low frontal

area with finance provided by the Air Ministry.

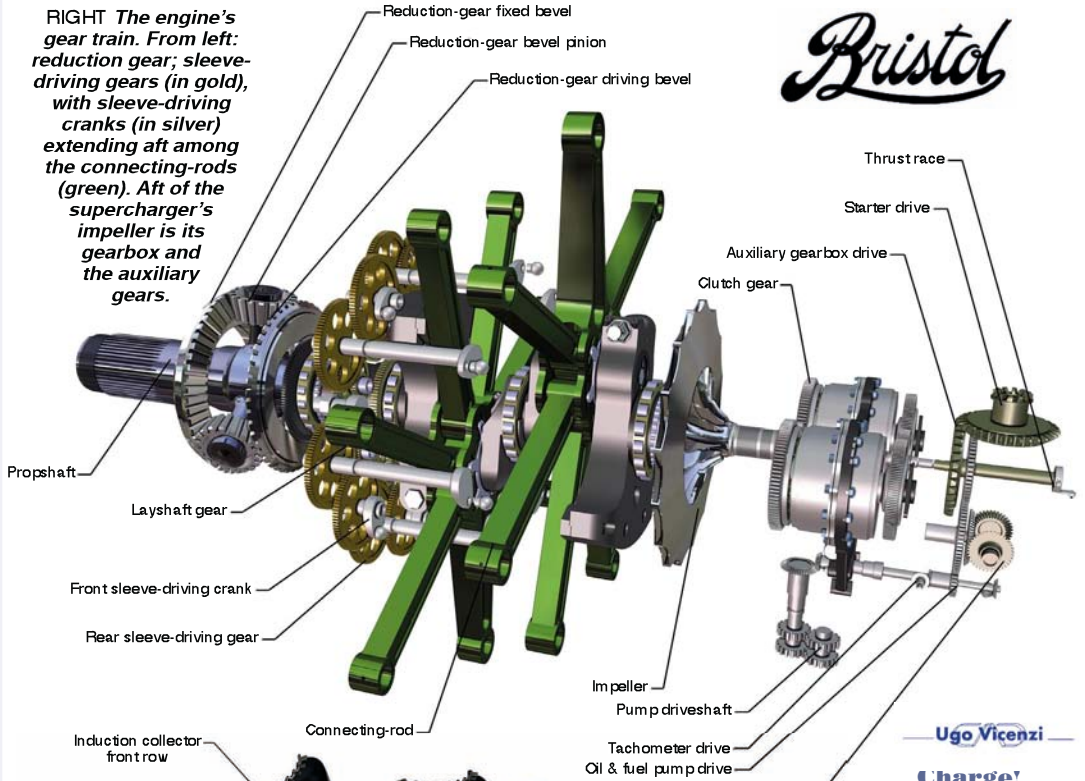
It is worth noting that how the mixture is admitted to, or exhausted from, the combustion chamber of an engine is not as important as the precision of regulation and the engine’s “gas-tightness” under the extreme conditions of temperature that are present.

The challenges of sleeve-valve development proved to be considerable. Typical cylinders are made of a machined aluminium alloy. Pistons are forged from a different alloy of aluminium and the sleeves are machined from iron barrels; all three parts are in close contact but have different expansion ratios as the engine warms. The constant risk is a complete seizing of the engine. Some tolerance would be required; a loose fit between cylinder, sleeve and piston perhaps, in order to allow for uneven thermal expansion, but in doing so the door to fresh and exhaust gases would not be fully closed, which would present another major problem.

Involved in the development phase of the sleeve-valve concept at Bristol were two important contributors. The first was Bristol Engines’ chief production engineer Frederick Whitehead, a former colleague of Fedden’s at Brazil-Straker who had joined Bristol in 1921, and who devised a way to produce a 100 per cent circular sleeve with a 0.0002in tolerance from a centrifugally-cast high-expansion steel.

Bristol

RIGHT The engine's gear train. From left: reduction gear; sleeve-driving gears (in gold), with sleeve-driving cranks (in silver) extending aft among the connecting-rods (green). Aft of the supercharger's impeller is its gearbox and the auxiliary gears.



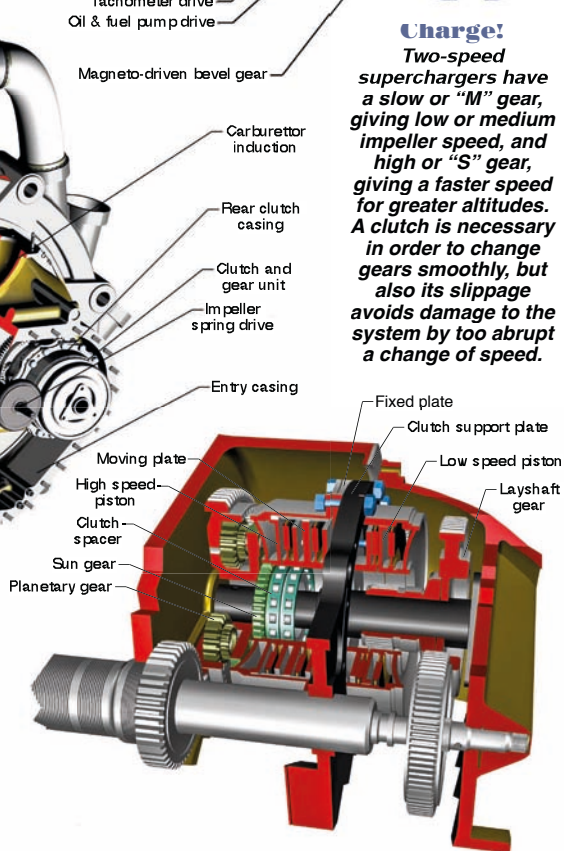
Ugo Vicenzi

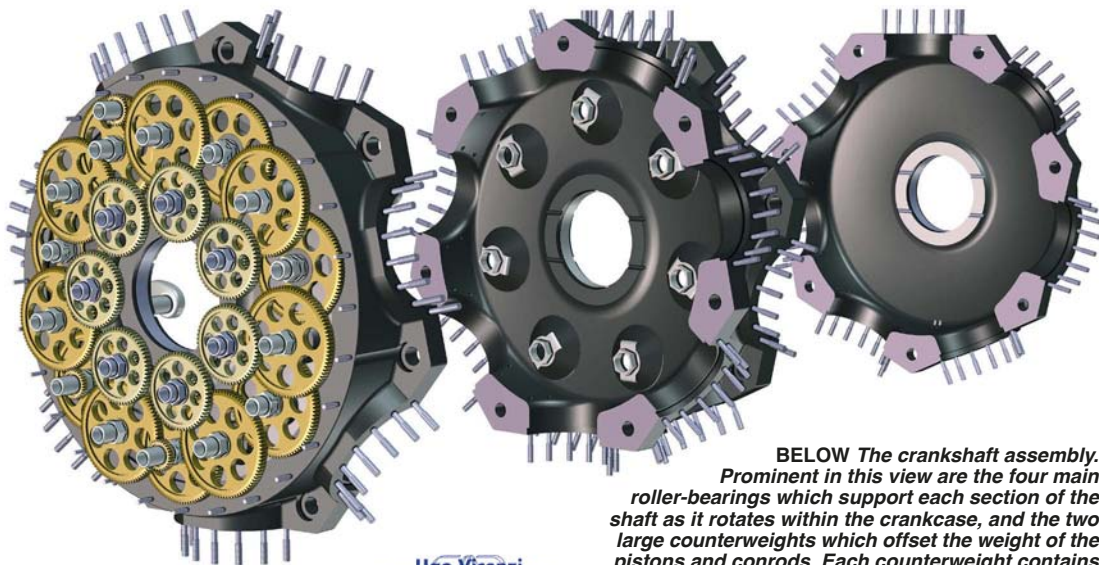
Charge!

Two-speed superchargers have a slow or "M" gear, giving low or medium impeller speed, and high or "S" gear, giving a faster speed for greater altitudes. A clutch is necessary in order to change gears smoothly, but also its slippage avoids damage to the system by too abrupt a change of speed.

ABOVE The supercharger impeller (gold) is driven via the clutch and gear unit aft of it, which provides two impeller speeds plus a smooth transition between the high and low speeds. The fuel/air mixture compressed by the supercharger is fed to the cylinders via induction pipes and collectors or "induction belts".

RIGHT This cutaway view of the supercharger clutch system shows the impeller driveshaft (silver) with the clutch mechanism beyond it.





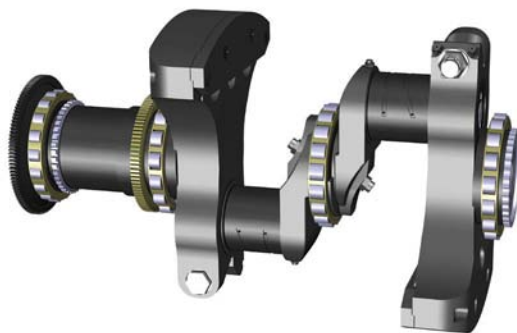
ABOVE This exploded view of the crankcase shows the sleeve gears mounted on its front face. The crankcase is made in three parts to house the two rows of cylinders (which are attached via the projecting studs seen bristling from the seatings in this view). The seven silver bearings in the centre section accommodate the rear sleeve-driving cranks.

The second was High Duty Alloys of Slough, which managed to create forged cylinders using an alloy with a thermal expansion rate similar to that of the sleeves.

In early 1931 Fedden abandoned the V12 concept in favour of a radial configuration, his colleague T.B. Barrington having conducted a thorough study which revealed that the most efficient arrangement for a sleeve-valve engine was either a single-row radial with an odd number of cylinders or a two-row radial with 14 or 18 cylinders. Late the same year Fedden began work on his first full-size sleeve-valve engine, a nine-cylinder single-row radial using cylinders the same size as those used in the ubiquitous Mercury poppet-valve engine. The engine was named the Perseus, and the prototype was completed in 1932. As Bill Gunston notes in *Fedden: The Life of Sir Roy Fedden* (Rolls-Royce Heritage Trust Historical Series No 26, 1998): "Externally it was by far the 'cleanest' and most elegant engine of its power ever made. Never before had anyone seen an engine so uncluttered or inherently simple. Moreover it ran with unbelievable smoothness. Instead of having bouncing poppet valves, everything went round and round. Men who had lived with engines all their working lives just came and listened, entranced at the soft sound of the Perseus".

Following in the footsteps of the Perseus was the Aquila of 1933, a smaller sleeve-valve engine designed for use in civil aircraft and using the

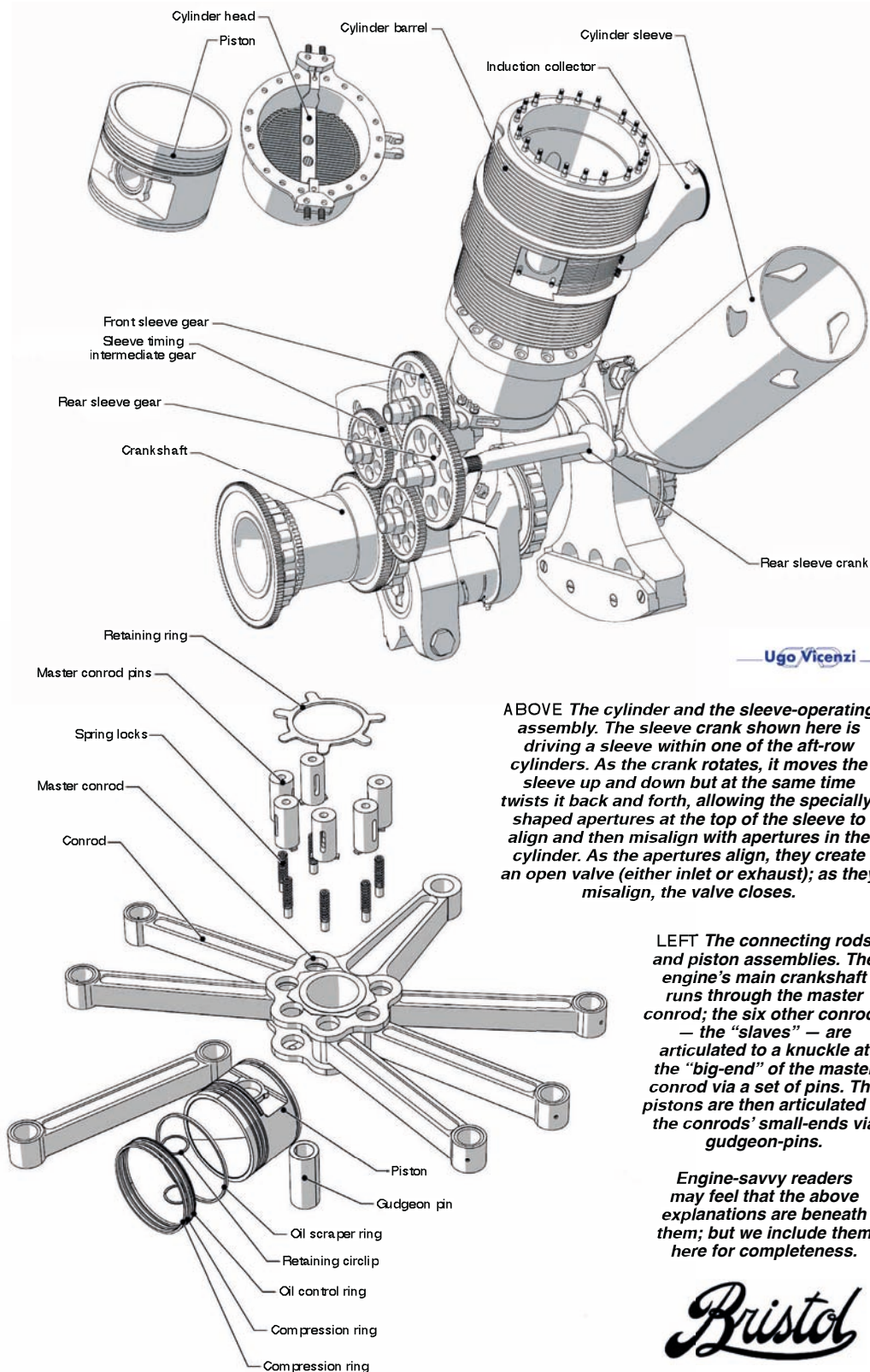
BELOW The crankshaft assembly. Prominent in this view are the four main roller-bearings which support each section of the shaft as it rotates within the crankcase, and the two large counterweights which offset the weight of the pistons and conrods. Each counterweight contains Salomon dampers (see panel on page 83).



Perseus cylinder. Although not used widely, the Aquila had developed some 500 h.p. by 1936. In the meantime, the Perseus had made its first flight in October 1933, fitted to a Bristol Bulldog.

It nevertheless took five years of experimentation (at a cost of some £2m) with different alloys, lubricating systems, machining tolerances and production methods to refine the sleeve-valve concept to a point at which it could be mass produced. One sleeve-valve engine folk legend relates that after plenty of failures, a single apparently reliable engine finally emerged. Nobody could understand why this specific unit was working until it was discovered that a worker had initially machined a sleeve with a precision milling head; he had then refined it with a rough-profile mill-head which should have been used only for rough cutting!

While the search for suitable materials continued, production of the Perseus was put in hand, each example being essentially handbuilt. Five Perseus IIs had been built by the summer of 1935, two of which were fitted to Short Syrinx G-ACBK. In October that year the Perseus entered production at Filton, despite the fact that each sleeve had to be hand-seated in its cylinder.



ABOVE The cylinder and the sleeve-operating assembly. The sleeve crank shown here is driving a sleeve within one of the aft-row cylinders. As the crank rotates, it moves the sleeve up and down but at the same time twists it back and forth, allowing the specially-shaped apertures at the top of the sleeve to align and then misalign with apertures in the cylinder. As the apertures align, they create an open valve (either inlet or exhaust); as they misalign, the valve closes.

LEFT The connecting rods and piston assemblies. The engine's main crankshaft runs through the master conrod; the six other conrods — the "slaves" — are articulated to a knuckle at the "big-end" of the master conrod via a set of pins. The pistons are then articulated to the conrods' small-ends via gudgeon-pins.

Engine-savvy readers may feel that the above explanations are beneath them; but we include them here for completeness.

Bristol

Built at Santa Monica in California, Northrop Gamma 2L G-AFBT was the only example on the British register, and was imported by Bristol in September 1937 for use as an engine testbed. After use in early flight trials of the Hercules, as seen fitted here, the aircraft was dismantled at Filton and stored throughout the war, before being broken up in November 1945.



These production problems were eventually ironed out, however, and the Perseus went on to power Short Empire Flying Boats, the Westland Lysander and the Blackburn Skua and Roc.

Enter the Hercules

Fedden was keen to design a two-row sleeve-valve engine and in March 1935 commenced work on the Hercules, a radial with 14 Perseus cylinders in two staggered rows. With the problems of seizing solved, another arose; how to make the sleeves move. Fedden chose to use a series of gears driven by the crankshaft, operating the sleeve via a shaft with a spherical joint. This system generated the least friction, but if the sleeve seized, the resulting load would destroy the spherical joint. On the Hercules, all the sleeves were operated via an impressive series of gears situated on the front of the engine, actuating the front sleeves via short shafts and the rear ones via longer shafts. On the subsequent larger 18-cylinder Centaurus, the

sleeves were still operated by gears and spherical joints, but the front sleeves were actuated by a cascade of gears in the front of the engine, while the rear sleeves were moved by a corresponding cascade at the rear.

The first Hercules was completed in December 1935 and bench-tests the following month yielded highly promising results. By November 1936 the 1,375 h.p. Hercules had been sufficiently developed to be exhibited at the Paris Air Salon, where it stole the show as the most powerful type-tested engine in the world. In 1937 Bristol acquired Northrop Gamma G-AFBT, to which was fitted a Hercules and test flown. With constant revisions and modifications, the Hercules went on to become one of the most successful piston engines ever designed, with more than 65,000 examples built, powering civil and military aircraft for the next three decades.

On another impressive sleeve-valve engine, Frank Halford chose to operate the 24 sleeves of the Napier Sabre via a driveshaft running the

Bristol Hercules engine data (major variants)

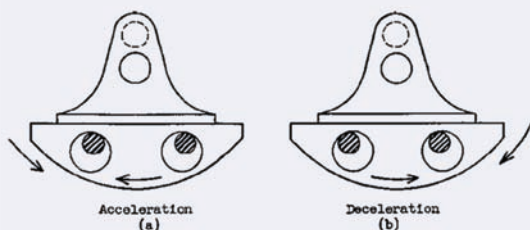
	Hercules I	Hercules VI	Hercules XVI	Hercules 100	730 series	Hercules 790
Bore	146mm	146mm	146mm	146mm	146mm	146mm
Stroke	165mm	165mm	165mm	165mm	165mm	165mm
Capacity	2,360in ³ (38.7lit)	2,360in ³ (38.7lit)	2,360in ³ (38.7lit)	2,360in ³ (38.7lit)	2,360in ³ (38.7lit)	2,360in ³ (38.7lit)
Comp. ratio	6.75:1	7.0:1	7.0:1	7.0:1	7.0:1	7.0:1
Power	1,150 h.p.	1,650 h.p.	1,615 h.p.	1,725 h.p.	2,040 h.p.	2,020 h.p.
Maximum r.p.m.	2,750 r.p.m.	2,900 r.p.m.	2,900 r.p.m.	2,800 r.p.m.	2,800 r.p.m.	2,900 r.p.m.
Fuel	87 octane	87/100 octane	87/100 octane	100/130 grade	100/130 grade	115/145 grade
Weight	1,845lb (838kg)	1,890lb (857kg)	1,890lb (857kg)	1,890lb (857kg)	2,045lb (927kg)	2,345lb (1,063kg)

Maneton and Salomon what? Joints and dampers explained ...



READERS WHO ARE NOT engine aficionados may not be familiar with the **maneton joint (ABOVE)**. A maneton joint is a means of clamping a component around a pin. The outer (female) part is split into two sections, with a maneton bolt running through them to pull the split closed, thus securing the joint around the (male) pin. In the Hercules, the joint was closed with two parallel bolts.

The **Salomon or puck-type damper**, patented by Bernard Salomon in the 1930s but also developed independently elsewhere, employs metal spheres or thick metal discs (the shape of a hockey puck) rolling around in a circular aperture within a crankshaft counterweight, as illustrated **BELOW**. The effect is to damp out the torsional vibrations which can otherwise severely damage a piston engine.



MICK OAKLEY

whole length of the engine and moving the sleeves via spur gears. This system had fewer problems in case of the seizure of a sleeve, but at the time no electrical motor was capable of starting an engine of the size of the Sabre. Hence a Coffman cartridge starter was used, perfect for a rapid start for the Hawker Typhoon and Tempest in which it was installed, but delivering an excessive load to the skew gears moving sleeves with a cold oil film and sometimes causing the distortion of the skew gears and thus blocking some of the sleeves.

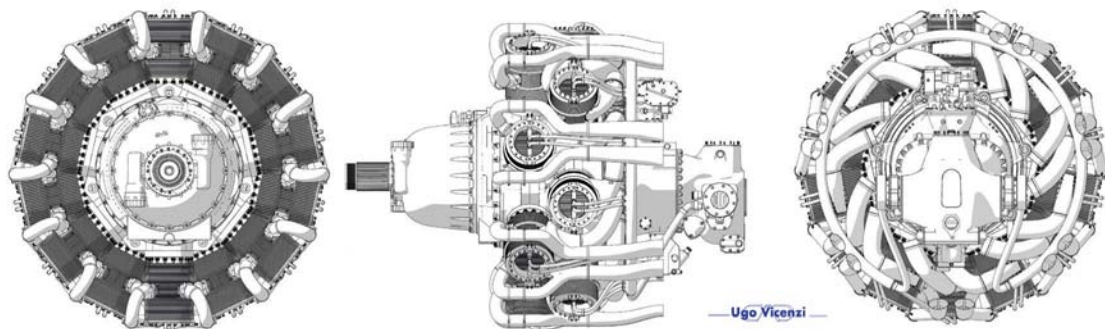
Every engine system has its disadvantages, but the Hercules proved to be a reliable workhorse for its peacetime work on transport aircraft, where time between overhauls was more important than the brute power of an engine like the Sabre. The Napier H-configuration 24-cylinder Sabre remains at the zenith of piston engine technology, at the price of a reliability rate good enough only for wartime.

Sleeve-valve technology rapidly disappeared

with the demise of large piston aero-engines, and today just a few Hawker Sea Furies are still powered by the Centaurus, while the Provence-based Noratlas retains its pair of French licence-built Hercules.

The nuts and bolts

The Hercules is a two-row 14-cylinder radial engine. The crankcase is made from three sections of forged aluminium alloy, the sections being held together by seven large bolts. The front section houses the 14 gears necessary to transmit motion from the crankshaft to the sleeves. The crankshaft is of forged steel and comprises three completely separable sections connected by maneton bolts (see panel above), so that the master connecting-rods can be made in a single piece. Each section of the crankshaft has its own bearing and each throw of the crankshaft has its own vibration damper and balance weights. Early marks of the Hercules employed large floating big-end bushes, later



ABOVE This three-view of the Hercules demonstrates the powerplant's compactness and its relatively clean exterior, devoid of the conventional radial engine's external poppet-valves and the pushrods necessary to operate them. Sleeve-valves also enable engines to operate efficiently at higher r.p.m. than poppet-valves.



ABOVE Classified in France as a Historic Monument, the Association Le Noratlas de Provence's Nord 2501, F-AZVM, has the distinction of being the last airworthy aircraft to be powered by the Hercules engine, in this case a pair of Hercules 739s. Thanks to the Association's remarkable efforts, the Noratlas continues to fly in 2020.

replaced by heavy spherical weights free to move into their receptacle in the crankshaft counterweight; this is where the Salomon dampers reside, responsible for the "thick-thick" sound heard at start-up (see panel on page 83).

The master and articulated conrods are machined from nickel-chrome steel. In order to accommodate the slightly different motion of pistons connected to master or conrods, the tolerances on the lands of the pistons connected to the master rods are greater than on normal pistons. The same applies to the oil-scraper rings on the master-rod pistons.

The sleeve-valve engine has a cylinder head unlike that of any other piston engine; with no valves the head takes the shape of a "junk head", apparently simple and having the spark plugs located in the best possible position on top of the combustion chamber. The compression ratio of the first Hercules was 6.75:1, later raised to 7.0:1. The supercharger is of the centrifugal type and is driven from the crankshaft by a spring-drive that absorbs inertial movements of the reciprocating engine and operates the impeller via two clutches, which move the impeller at low and high speed for operations at different altitudes, while being able to switch speeds in a gradual way that does not damage the vital impeller.

The two clutches are operated by oil pressure from the engine. The reduction gear is of the epicyclic bevel-gear type. Early Hercules marks used traditional carburettors, later replaced by injection carburettors. Other engine components, such as the starter-motor location and exhausts, were varied during engine development, but

The French Hercules

WHEN FRANCE'S NORD Noratlas prototype was introduced in 1949, it was powered by a pair of 1,600 h.p. Gnome-Rhône 14R radial engines. As a result the aircraft was deemed to be underpowered, but a solution was in hand with the licence-building of the Bristol Hercules by the *Société Nationale d'Etudes et Construction de Moteurs d'Aviation* (SNECMA), which already had a connection with Bristol, having previously licence-built the Jupiter. In 1951 SNECMA acquired a licence to build the Hercules at the former Renault plant at Billancourt, a suburb of Paris.

Accordingly, Hercules 739, 790 and 791 variants were produced at Billancourt. The 739 incorporated rear-swept exhaust pipes and a torquemeter; the 790 was fitted with a redesigned rear cowl and revised starter position, while the final 791 included all these modifications and added a new torquemeter. Some 1,400 examples of the powerplant were produced for the Noratlas project by the end of production in 1964. **UV**

essentially the Hercules remained similar to its original version throughout its development. At the same time, though, it had sufficient development potential to increase power from the original 1,150 h.p. to the 2,200 h.p. of the last Hercules 790, which used water injection for take-off and required the most refined 115/145 grade aviation gasoline.



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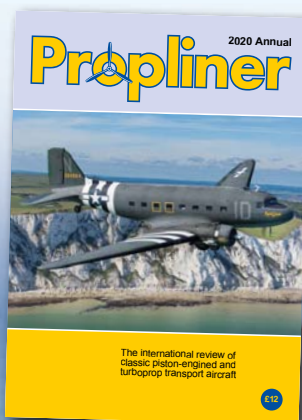
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ITALY'S FORGOTTEN AIRLINES

PART ONE / THE EARLY YEARS: SISA, SANA, TRANSADRIATICA AND AEI

In the first part of a new series detailing the evolution of Italy's commercial air services, renowned civil aviation historian **MAURICE WICKSTEAD** starts at the beginning, with the establishment of the nation's first four "grandfather" airlines. By the 1930s they had established a sizeable network across the Mediterranean and even into mainland Europe

AMONG THE NATIONS of Europe, Italy was a relative latecomer to the field of commercial aviation. It was not until 1926 that its first airlines were established. Before this, the only significant events in Italian commercial aviation were a number of experimental mail flights in May and June 1917, employing military FBA (Franco-British Aviation) floatplanes that ran briefly between Rome and Turin, Rome and Sardinia and Naples and Palermo. Another mail flight took place in late June 1925 between Livorno and Rome, undertaken with a SIAI S.16 of the *Regia Aeronautica's* No 144 Hydroplane Squadron, to coincide with the 12th Philatelic Congress in Livorno.

Italy emerged from the First World War in a poor and weakened state. Its decision to side with

the Entente Powers (France, Great Britain and Russia) in 1915 did not bring about the promised benefits of subsidies, loans and additional territory in what would become Yugoslavia. The parlous state of the economy resulted in widespread civil unrest and aided disaffected socialist Benito Mussolini in creating his *Partito Nazionale Fascista* (National Fascist Party), which seized power from a weak government in 1922.

From 1925, having consolidated his hold on the country, Mussolini and his administration oversaw a period of intervention in the economy through large-scale nationalisation of banks and holdings in major industrial concerns. By 1939 Italy had the largest concentration of state-controlled businesses outside the Soviet Union.

By the mid-1920s, enjoying its first balanced

budget for many years, Italy was in a position to begin expanding into new areas, not least of which was the opening up of commercial air routes. Keen to showcase his new Italy, Mussolini fostered the modernisation of its aviation assets, both civil and military. To this end, the air estimates for the civil sector alone were increased fivefold during 1924–28. A significant advantage for Italy as a result was the establishment of a number of innovative aircraft and engine manufacturers, particularly in the area of seaplane design, which would provide the emerging airlines with state-of-the-art equipment with which to get started.

ITALY'S FIRST AIRLINE

The first of these new commercial aviation ventures was *Società Italiana Servizi Aerei* (SISA), founded in 1922 by brothers Augusto and Oscar Cosulich, third-generation scions of a dynastic family maritime business originally established in 1857, based at Trieste. Among the interests of the entrepreneurial Cosulich siblings was a hotel complex in the coastal spa town of Portorose (now Portorož in Slovenia). The brothers' increasing curiosity about aviation led to the purchase of an FBA floatplane with the aim of conducting local

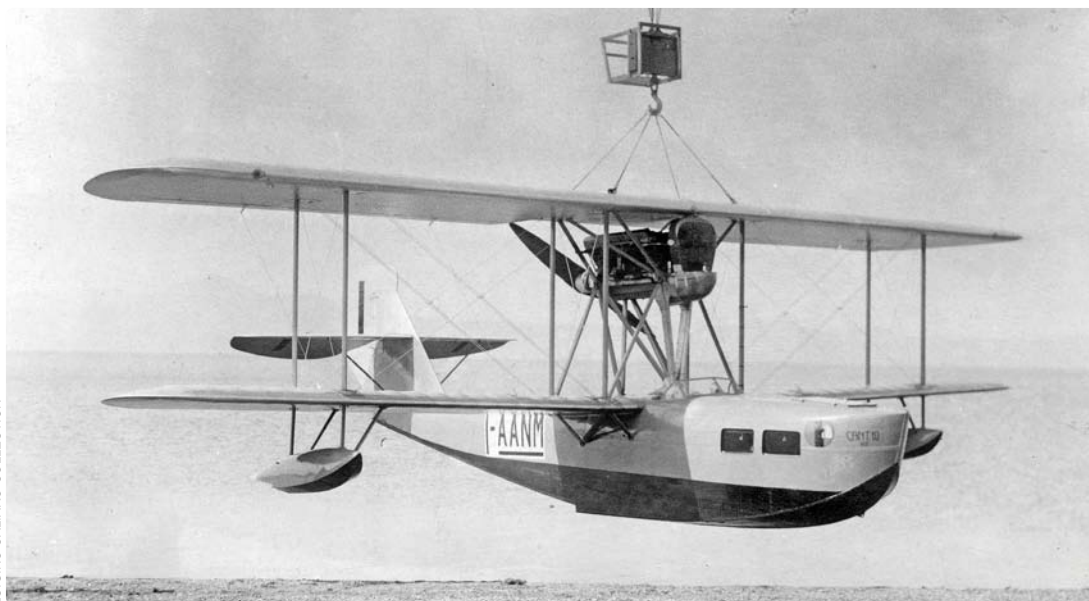
pleasure-flights for guests and transporting them to nearby Trieste, or even as far as Venice. The venture proved moderately successful and with the addition of two more FBAs, some 1,200 flying hours were accrued during 1921–23.

Looking to expand the venture, a flight school was opened at Portorose in 1924 and a contract was gained from Italy's Ministry of Aeronautics to train military pilots. A number of the successful students would go on to become crew members on General Italo Balbo's long-distance aerial cruises of the early 1930s. This increased activity saw the SISA fleet enlarged to 25 FBAs and the construction of hangars, a slipway and other necessary facilities.

Aeronautical workshops were also established at Monfalcone on the Gulf of Trieste, taking their name from the shipyard complex, *Cantieri Aeronautici e Navali Triestini* (CANT), which would be responsible for a large number of innovative seaplane designs, initially by engineer Raffaele Conflenti (formerly with SIAI and CAMS of France). The second of these was the four-passenger CANT 10ter flying-boat, designed specifically for SISA, the latter acquiring most of the 16 examples built.

Seen here "on the step" at Trieste, CANT 10ter I-OLTE (c/n 5) was acquired by SISA in March 1926 and operated the first Turin–Trieste service for the airline the following month. It continued to serve with SISA until it was destroyed in an accident in March 1932. LUIGINO CALIARO COLLECTION





ABOVE During 1929–30 a modified version of the CANT 10ter was developed with a metal hull with duralumin sheet skin and redesigned bows. A two-seat cockpit with side-by-side seating was incorporated and the wooden-hulled 10ter's five passenger cabin windows were replaced with two larger windows. This is one of the first two.

In August 1925, aware that Italy was behind in the commercial aviation stakes, the government issued authorisation for five routes with generous subsidies. These were:

- Line No 1: Trieste—Venice—Milan—Turin;
- Line No 2: Trieste—Zara (now Zadar, Croatia);
- Line No 3: Naples—Palermo, Sicily (subsequently extended to Rome and Genoa);
- Line No 4: Brindisi—Athens (Greece)—Constantinople (Istanbul, Turkey);
- Line No 5: Venice—Klagenfurt (Austria)—Graz—Vienna.

Line No 1 was awarded to SISA with a 50 per cent subsidy up to a maximum of 38,000km (23,600 miles) on the basis of uplifting a maximum of 50kg (110lb) of mail along the line. After months of intense activity, including the establishment of marine bases, emergency alighting areas and passenger facilities, all was in place by March 1926. On the 26th, two CANT 10ters — I-OLTC and I-OLTD, piloted by Antonio Majorana (SISA's commercial director) and Cdr Giuseppe Bertocco — embarked on the last of a long series of proving flights. Carrying two members of the local press both aircraft departed Portorose at 1130hr. After an hour's flight Venice was reached for a refuelling stop at Sant'Andrea island. From there the aircraft tracked along the River Po for a further halt at Pavia, where two more newspaper journalists were embarked for the final leg to Turin, reached at 1755hr.

CLEARED FOR TAKE-OFF

On April 1, 1926, a grand inaugural ceremony took place, with two CANT 10ters, one from each end of the line, carrying distinguished guests

from local government, the aviation authorities, Regia Aeronautica and national newspapers. Even Mussolini put in an appearance at Turin to witness the arrivals from Trieste. The director of the Italian Post Office also announced the regular carriage of mail over the line. For this purpose a special mailbox was positioned at Trieste's main post office, allowing postings to be made up to 90min before departure. The service was opened to the public, offering three daily departures each week in both directions, taking an average of 5hr 10min for the 480km (300-mile) journey for a one-way fare of 350 Lire.

A new flying-boat emerged from the Monfalcone workshops in 1927. The CANT 22 trimotor could accommodate up to 12 passengers in comparative luxury with improved seating, curtained windows, interior lighting and a small lavatory. The first example, I-AABN, named *San Marco*, was delivered to SISA in late 1928 and used for the new circular route around the Adriatic. Linking Trieste, Venice, Ancona and Zara, the route was first flown on December 15 that year.

Several months later, a metal-hulled version of the CANT 10ter was rolled out of the factory. Flown by First World War ace and CANT/SISA test pilot Mario Stoppani, one of the first two registered — I-AANM or I-AANN (probably the former) — left Trieste in mid-May 1929 for Lake Bracciano, where it was inspected by Italo Balbo, head of the Regia Aeronautica. Thereafter, the aircraft proceeded to Genoa for a demonstration to the directors of another airline, *Società Anonima Navigazione Aerea* (SANA). This gave rise to speculation that the two companies would co-operate over a route linking Genoa with Milan,



ABOVE In 1928 SISA took delivery of I-AABN, its first example of the three-engined CANT 22, powered by a trio of 200 h.p. Isotta-Fraschini Asso 200 six-cylinder inline engines in tractor configuration. Named San Marco in SISA service, I-AABN was later absorbed into the state-owned Società Aerea Mediterranea and ultimately, Ala Littoria.

but nothing materialised. Instead, on October 5, 1929, a proving flight was undertaken covering Trieste—Venice—Pavia—Genoa and Marseille in France, but although an agreement was signed with the government, again, nothing came of it.

SANA JOINS THE RANKS

Established in Genoa in January 1925, SANA was the second Italian airline to take to the skies, and had been formed as a joint venture between the *Banca Commerciale Italiana* and *Società Anonima Italiana Costruzioni Meccaniche* (SAICM), Italian holder of the licence to build German Dornier seaplanes. The initial stock capital was 1m Lire. Production of the Dornier Wal, known in Italy as the Dornier Wal Cabina, began in 1922, and in November 1925 SAICM changed its name to the more widely known *Costruzioni Meccaniche Aeronautiche Società Anonima* (CMASA).

The new airline received its first two Wals —

I-DAUR and I-DAER — at the end of February 1926, and on March 2 both aircraft departed on a series of trial flights over the 1,070km (665-mile) extended Line No 3 route, covering Genoa—Rome—Naples—Palermo. On April 7 the first official service over the route took place with flights operating in both directions on alternate weekdays. During its first season of operations (up to December 31, 1926) SANA carried 1,814 passengers and 4,850kg (10,690lb) of cargo/mail over 162,770 km (101,140 miles) during the course of 1,076 flying hours, although despatch reliability was only some 66 per cent.

By late 1927 SANA's fleet had increased to nine Wals, enabling the line to be split in two at Rome, with the service operating daily over each sector and arranged to connect with express trains from Paris at Rome and steamers to Alexandria in Egypt from Naples. Some of SANA's later Wals were built by Rinaldo Piaggio's eponymous

BELOW Italy became the biggest operator of passenger-configured Dornier Wals, with some 26 being used on the early Italian air services. Built in numerous variants, the Wal was powered by various engines, this Piaggio-built example, I-AZDI of SANA, being fitted with a pair of Bristol Jupiter IVs in the type's distinctive tandem configuration.

LUIGINO CALIARO COLLECTION



Powered by four Gnome-Rhône-built Jupiter engines in paired tandem configuration, Dornier Super Wal I-REOS (c/n 144) was one of six operated by SANA from October 1928 and served with the airline until it was destroyed in May 1934. The other SANA Super Wals were I-RATA (c/n 145), I-RENE (c/n 141), I-RIDE (c/n 142), I-RONY (c/n 170) and I-RUDO (c/n 171).

LUIGINO CALIARO COLLECTION



company, Piaggio having been a founding director of the airline.

In January 1928 SANA took delivery of the first two (I-RENE and I-RIDE) of its six four-engined Dornier Super Wals, with accommodation for up to 20 passengers. The new aircraft enabled SANA to expand its horizons and on November 1, 1928, a weekly service was opened over the 1,210km (750-mile) route connecting Rome with Tripoli in Libya via Syracuse on Sicily (and later Malta). This was especially important as the first regular air service linking the Italian mainland with Libya, won from the Ottoman Empire in 1911 and settled by around 150,000 Italian emigrants.

Four days later, on November 5, one of the Super Wals embarked on another major route, connecting three of the Mediterranean's major

port cities — Barcelona in Spain, Marseille and Genoa — with Rome, slashing the surface-journey time by up to 75 per cent. Negotiations over the Barcelona service had been started with the Spanish government back in May 1925, but had foundered over Spanish demands for a 33 per cent stake in SANA. A further concession was also obtained from the French government, allowing SANA to extend its Rome—Naples route onwards to Tunis, the Tunisian capital, while the French gained access to Naples and Rome airports on their regular services to the Orient. Emphasising the prestige of its services, SANA adopted unique marketing titles for each: *Freccia Rosso* (Red Arrow) for Rome—Tripoli and *Freccia del Mediterraneo* (Mediterranean Arrow) for Barcelona—Marseille—Genoa, for example.

BELOW Super Wal I-RENE was one of the first two delivered to SANA in late 1928, and operated with the company until it was withdrawn from use in June 1930. The Super Wal was a larger version of the Wal, with a 93ft 6in (28.5m)-span wing of metal two-spar structure with a smooth duralumin leading edge and fabric-covered trailing edge.

LUIGINO CALIARO COLLECTION



CANT 10ter I-AASH (c/n 206) of SISA at Fiume, located in Kvarner Bay, an inlet of the Adriatic, now the main seaport and third-largest city in Croatia. This machine was delivered in December 1930 and was one of the batch of four metal-hulled examples delivered to SISA from the summer of that year.

LUIGINO CALIARO COLLECTION



In April 1929 SANA embarked on yet another long-distance service, this time to Alexandria in Egypt. Originating at Genoa, the 2,895km (1,800-mile) route, flown with the Super Wal, staged via Rome, Naples, Corfu (Greece), Athens, Rhodes and Tobruk (Libya). But it was short-lived and was closed in 1930, having carried just 257 passengers during the course of 33 round trips. In reality it had been a purely political gesture after a breakdown in talks with Britain's Imperial Airways Ltd (IAL), which wanted to operate a through service from London to Alexandria via Italy; SANA had seen this as an opportunity for a pool service, but the Italian authorities denied IAL overflying rights, forcing it to transfer its passengers overland by rail to Brindisi to catch a flying-boat for the trans-Mediterranean leg.

SISA REORGANISES

Meanwhile, SISA had not been idle, and at the beginning of January 1930, after several proving flights, the airline began flying between Trieste, Fiume (now Rijeka in Croatia) and Zara thrice weekly, later extending the route westwards to Venice. The Free State of Fiume had been annexed by Italy from March 1924, while the 104km² (40 square-mile) Zara enclave had become Italian territory after a treaty was signed with the Kingdom of the Serbs, Croats and Slovenes (later Yugoslavia) in 1920.

In April 1930 two further SISA routes were

opened, linking Trieste, Venice and Genoa thrice-weekly with a CANT 22, and Trieste, Brioni (now the Brijuni Islands in Croatia) and Venice daily. In July 1930 three examples of the six-passenger metal-hulled CANT 10ter Series 2 entered service with SISA. That year proved to be a turning point for the company — the financial repercussions of the 1929 stockmarket crash in America were being felt worldwide, not least in Italy. Many private business owners were facing difficulties, including the Cosulich brothers, who were dangerously exposed to the banks and, as a result, were being drawn into the new era of Italy's growing nationalised industrial regime. The state-controlled Banca Commerciale Italiana had obtained a majority stake in the Monfalcone shipyard and in June 1930 the various subsidiaries, including SISA and the aeronautical workshops, were merged under the title *Cantiere Riuniti dell'Adriatico* (CRDA).

In the subsequent reorganisation, the aeronautical aspect became a separate division under the overall management of Augusto Cosulich, and was itself divided into two sections; one for the construction of seaplanes, the other concentrating on landplanes. Overall direction was in the hands of engineer Filippo Zappata, who would be responsible for many of the classic CANT aircraft of the 1930s. The first of these, the single-engined CANT Z.501 Gabbiano (Gull), was built in response to a request from the Regia



LUIGINO CALIARO COLLECTION x 2

ABOVE CANT 22 I-ALFA (c/n 230) was named *San Sergio* in SISA service and joined the company in June 1931. An unequal-span biplane with a single-step wooden hull and single fin and rudder, the type was fitted with two side-by-side cockpits situated midway between the wings and the bow. The passenger cabin, seen at RIGHT, was aft of the cockpits and incorporated three large rectangular windows in each side. The CANT 22 was comfortable and operated on SISA's Trieste—Genoa and Trieste—Ancona routes.



Aeronautica and first flown by CRDA test pilot Mario Stoppani in March 1934. On October 18 that year, registered as I-AZIL, it departed Trieste on a record-setting flight to Massaua (Massawa) in Italy's African colony of Eritrea, covering the 4,130km (2,560 miles) in 26hr 35min.

Accidents were fairly common in these early days of commercial aviation, but for the Cosulich family one was particularly tragic. Early on the morning of August 20, 1930, SISA's CANT 22 I-AACL *San Giusto* was heading towards Zara with 15 passengers aboard, including ten-year-old Emma, daughter of Oscar and Augusto's brother Guido, and her maternal grandmother. Over the island of San Pietro dei Nembi (now Sveti Petar in Croatia), the aircraft shed its port propeller, parts of which penetrated the cabin, killing young Emma and seriously injuring her grandmother. This was the second calamity to befall the family; in July 1926 Oscar Cosulich had drowned at Portorose while attempting to save his six-year-old son, who had fallen into the sea from a sailing-boat.

As a consequence of its financial difficulties, SISA began downsizing its activities in 1932 and only operated services from Venice and Trieste down the Dalmatian coast, although trial flights were conducted with a CANT 22 over the route Trieste—Lošinj (now in Croatia)—Zara—Lagosta (now Lastovo in Croatia)—Durazzo (now Durrës in Albania)—Brindisi.

In May 1934 the house flag of SISA gave way to that of *Società Aerea Mediterranea* (SAM — to be covered in Part 2). In the preceding eight years Italy's "grandfather airline" had completed 12,093 flights over the course of 28,330 flying hours, covering a total of 4,032,286km (2,505,546 miles), during which 59,021 passengers, 74,774kg (164,850lb) of mail and newspapers and 447,176kg (985,854lb) of goods and baggage had been transported at an average despatch regularity of 99.4 per cent.

SANA ENDURES

While SISA's operations were gradually declining, those of SANA remained buoyant. Following a trial flight in September 1931 by SANA pilot Luigi Bonotto in Wal I-AZED, a new service was inaugurated extending the Barcelona service to Los Alcázares (for Cartagena) and Algeciras in southern Spain. Here a link was made with transatlantic steamers calling at nearby Gibraltar, as well as connecting with the newly opened Gibraltar Airways seaplane service to Tangier in Morocco. This service was primarily for the transfer of mail, but passengers could also be accommodated.

Having been very satisfied with its Dornier Wals, of which a total fleet of 25 had been acquired, SANA turned its attention to Dornier's giant 12-engined Do X and in 1931 ordered two examples. The plan was to use these behemoths



ABOVE In 1931 SANA ordered two examples of Dornier's massive Do X, powered by 12 Fiat A.22R 12-cylinder water-cooled engines. The Italian Do Xs were intended to be used on a prospective route from Trieste to Cadiz in Spain via Genoa, Marseille and Barcelona, but they never entered service with SANA and were ultimately scrapped.

on the Tripoli service, with a view to extending this route further at some future stage. The first, I-REDO, christened *Umberto Maddelena*, appeared in Italian skies in August 1931, with the second machine, I-ABBN *Alessandro Guidoni*, arriving in May 1932. In the event, neither was delivered to SANA, instead being transferred to the Regia Aeronautica, with which they found little use and were withdrawn in 1935 and scrapped in 1937.

The last SANA statistics available indicate that in 1932 the airline flew 1,330,000km (807,880 miles) during the course of 8,797 flying hours and uplifted 9,990 passengers, 37,417kg (82,490lb) of mail and 293,229kg (646,459lb) of cargo, newspapers and baggage. While SISA and SANA had been the prime movers in the development of Italy's early air services, two other companies also made a significant contribution.

ENTER TRANSADRIATICA

In October 1924, before air services had been fully established in Italy, the German Junkers organisation expressed an interest in extending the reach of its family of associated airlines into southern Europe. Accordingly, discussions were held with Karl Kupelwieser, son of Austrian industrialist Paul Kupelwieser, who had purchased the Brioni (Brijuni) Islands off Croatia's Istrian Peninsula. After his father's death in 1919, Karl had continued to develop the islands into a fashionable holiday and spa resort,

attracting Europe's bourgeoisie, and planned to open an air service between Vienna and nearby Trieste to aid the flow of visitors to the islands.

This progressed with the formation of *Società Anonima Italiana Navigazione Transadriatica* in late 1925, founded by Renato Morandi, a young engineer from Ancona, together with his brother Mario and lawyer and former military pilot Domenico Giuriati. Operations began in Ancona using a single Macchi M.18 flying-boat, I-BASA, but switched to Venice's Lido (Nicelli) Airport in April 1926. This came about as a result of the choice of Junkers-F 13 landplanes for Transadriatica. As a young student in Naples, Morandi had known members of the Junkers family and as a result was invited to the manufacturer's *Flugzeugwerke* at Dessau, which in turn led to the hiring of German technical personnel to help establish the new airline. It had been anticipated that Transadriatica would join the Europa Union group of Junkers-affiliated airlines, but the plan faltered after Junkers began to experience financial difficulties in 1926.

Equipped with a fleet of six four-passenger F 13Ls, Transadriatica launched its inaugural service on August 18, 1926, when I-BATB, commanded by chief pilot Riccardo Pasquali, flew from Venice to Vienna (Aspern) via Klagenfurt in Austria (a version of Line No 5). Thereafter, the line operated daily except Sundays, in association with Austrian airline *Österreichische*

RIGHT *Junkers-F 13 I-BATB (c/n 778) joined the Transadriatica fleet in August 1926 and flew the new airline's inaugural service, from Venice to Vienna via Klagenfurt, on the 26th of that month.*

BELOW *Originally operated by Deutsche Luft Hansa as D-963, Junkers-G 24ge trimotor I-BAZI (c/n 947) was acquired by Transadriatica in April 1927 and was absorbed into the SAM fleet, along with G 24 I-BAUS, in late 1931.*



ROB MULDER VIA LENNART ANDERSSON



ROBERTO GENTILI VIA LENNART ANDERSSON

LEFT *The Junkers-F 13 was an advanced design for its day and could accommodate four passengers (and evidently a baby as well!) in the enclosed cabin and two crew in the open cockpit. Using Junkers-F 13s and G 24s, Transadriatica had expanded its services as far north as Vienna and Munich and as far south as Brindisi by mid-1928.*

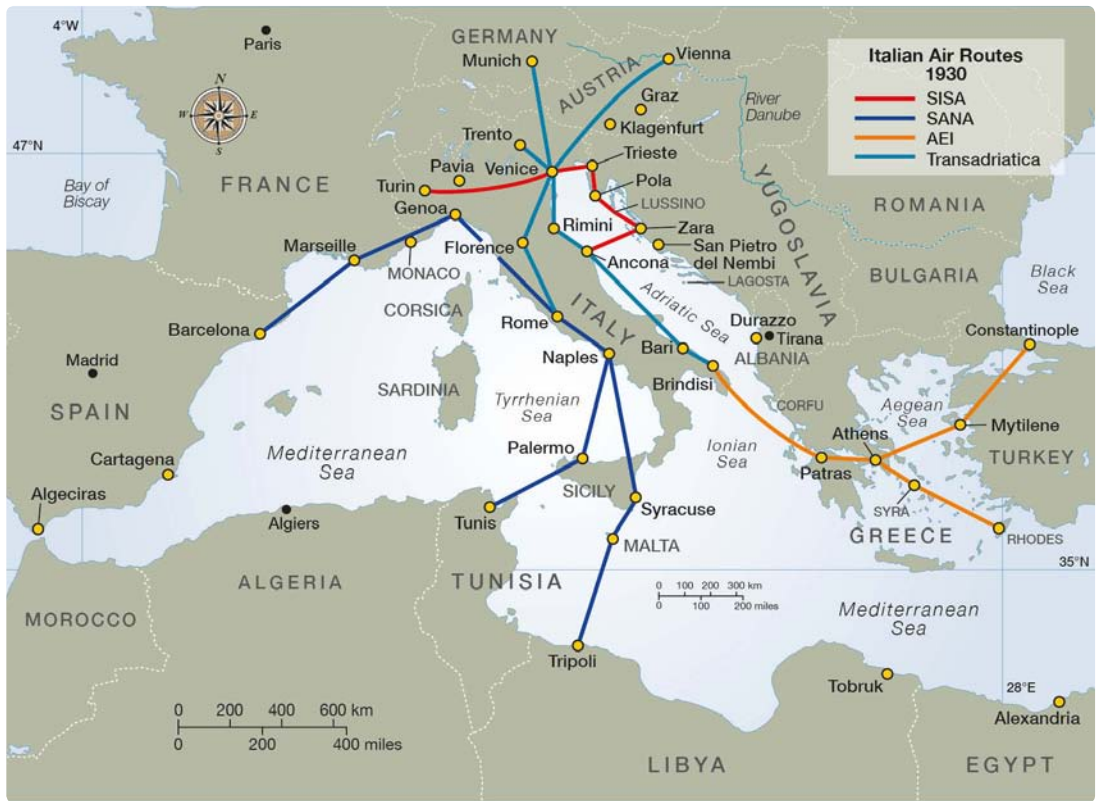
BELOW *One of Transadriatica's two Junkers-G 24 trimotors, I-BAUS (c/n 924) awaits its next flight at Vienna's Aspern airport. In December 1931 Transadriatica was taken over by SAM, both G 24s and eight F 13s being subsumed into the latter's fleet.*

LUIGINO CALIARO COLLECTION



ROBERTO GENTILI VIA LENNART ANDERSSON





MAP BY MAGGIE NELSON

Luftverkehrs AG (OLAG); from 1928 the Austrian technical stop was switched to Graz. An extension to Rome (Monticello) was added at the end of January 1927, employing a pair of nine-passenger Junkers-G 24 trimotors (I-BAUS and I-BAZI) by the spring of that year.

Transadriatica's expansion continued in April 1928 with a new service between Brindisi and Venice via Bari and Ancona (Loreto), extended to Munich from May 1931 in conjunction with Germany's *Deutsche Luft Hansa*. Later the same year another route was established between Venice and Monaco via Trento in northern Italy, while a second service between Rome and Venice was opened with a stop at Florence. Meanwhile, the fleet was further enlarged with a Junkers-W 34b and an American Hamilton Metalplane H-47.

Tragedy struck the airline in October 1930, with the untimely death of Renato Morandi in an accident at Rome's Littorio airport. On December 31, 1931, Transadriatica was absorbed by SAM.

ESPRESSO TO GO

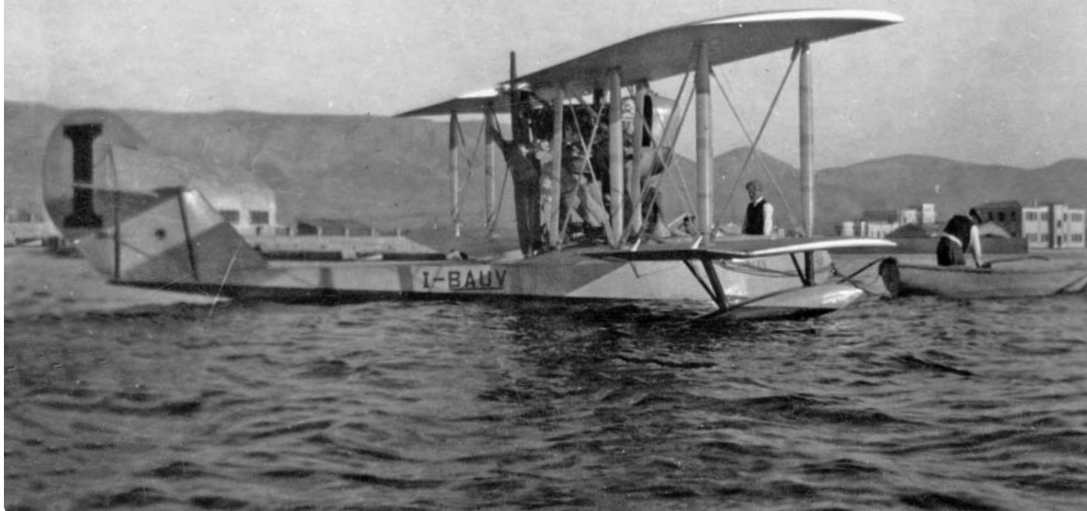
Another airline that ventured beyond Italian shores was *Società Anonima Aero Espresso Italiana* (AEI), aka *Aeroespresso del Levante*. The company was established at Rome in December 1923 on the initiative of Giuseppe Volpi, 1st Count of Misurata, an eminent businessman and Governor of Tripolitania, and was controlled by the Banca Commerciale Italiana. Playing an important part

in the early days of the airline was *Major* Umberto Maddalena, given leave by the Regia Aeronautica to act as consultant to the airline for one year. A decorated First World War naval pilot, Maddalena would later be celebrated for leading the aerial expedition which found Umberto Nobile's stranded party in the Arctic in 1928, following the downing of his airship *Italia* and, later, as a record-setting pilot on Balbo's long-distance flights.

A fleet of twin-hulled Savoia-Marchetti S.55C flying-boats was obtained by AEI, enabling services to commence over Line No 4; Brindisi—Patras (Greece)—Athens—Mytilene (Lesbos)—Constantinople (Istanbul), a route of 1,437km (895 miles). The inaugural service, flown by Maddalena in S.55C I-AMES, departed Brindisi with much ceremony at 0840hr on August 1, 1926, and after an uneventful flight reached Athens (Palaio Faliro) at 1330hr. The second sector was completed by I-ADIM, which departed Athens at 0900hr on the same day, reaching Constantinople (Büyükdere) at 1400hr. The service closed on December 31, 1926, but was reopened on May 1 the following year on a weekly basis. A fare of 700 Lire, then a considerable sum, was never going to attract large numbers of passengers, and in the first year just 708 were carried, although the figure had improved to 1,176 by 1930.

In 1923 Rhodes and the Dodecanese islands had been ceded to Italy, following their seizure during the Italo-Turkish War of 1911–12, and

In December 1926 AEI acquired a pair of Savoia S.16ter five-seat flying-boats, I-BAUT (c/n 5148) and I-BAUV (c/n 5129). The latter is seen here undergoing maintenance on its single 400 h.p. Isotta-Fraschini-built Lorraine-Dietrich pusher-configured engine. The passengers and crew were accommodated in two open cockpits forward of the wings.



LUIGINO CALIARO COLLECTION

BELOW Dornier Wal Cabina I-AZDH was acquired by AEI in September 1927 and served with the airline until it was written off after being damaged by fire in Mytilene Harbour on Lesbos on June 10, 1930. In the summer of 1934 AEI was one of the airlines that, in concert with SISA, SANA and SAM (incorporating Transadriatica), formed Ala Littoria.



LUIGINO CALIARO COLLECTION

BELOW Bearing the legend "Aero Espresso Italiana" on the outer sides of its distinctive twin hulls, Savoia-Marchetti S.55C I-ABOR awaits its next flight. The machine joined the AEI fleet in August 1925, but had a short career, being lost in a crash crossing the Sea of Marmara on a service to Constantinople in September 1927.

LUIGINO CALIARO COLLECTION





ABOVE Minus its tandem Isotta-Fraschini Asso 500 engines on the central pylon, S.55C I-AGRO (c/n 10505) undergoes maintenance at AEI's workshops in Brindisi. This example, one of the five operated by AEI, fared slightly better than I-ABOR, serving the airline for eight years from March 1926 until its demise in a crash in August 1934.

were administered as the "Italian Islands of the Aegean". Thus it was natural that they would eventually receive an air service, and in preparation AEI undertook a proving flight between Athens, Syra (or Syros in the Cyclades) and Rhodes (Egeo) on February 28, 1930. This was followed by an inaugural service over the route Rhodes—Athens—Brindisi and vice versa on April 1, on this occasion flown with a Wal.

A sole three-engined 22-passenger Savoia-Marchetti S.66 flying-boat entered AEI service early in 1934, reducing the journey to Athens to 2hr 30min. Following several serious mishaps with the S.55s, Maddelena determined that the prime cause was their underpowered Lorraine-Dietrich engines, and throughout 1927 they were gradually superseded by Dorniers.

In August 1930 mail was flown all the way from Athens to Venice, via a connection with Transadriatica at Brindisi. An innovation that boosted passenger numbers was the introduction of "package trips", including air transport, hotel accommodation and discounted rail fares on connecting services, although the prime source of revenue came from carrying mail and freight.

From tentative beginnings, Italy's independent carriers had shown the way, and by the early 1930s had developed a significant European network. Over the next few years, however, they would all disappear into a single state-run carrier — Ala Littoria.



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LT-COL FERN VILLENEUVE, AFC

hawk one

PART 1: THE FLEDGLING YEARS



TAH ARCHIVE

One of Canada's most illustrious airmen, **Lt-Col FERN VILLENEUVE** died on December 25, 2019. Best known as the founding leader of the RCAF's Golden Hawks innovative formation aerobatic team, his 32-year Service career took in much else besides. In the first half of a previously unpublished 2005 interview with *TAH's* Editor, Fern traces the first decade of his remarkable life in aviation

IT WAS WITH great sadness that we learned of the death of Lt-Col Fern Villeneuve AFC, one of Canada's most distinguished aviators and a much-valued friend, on December 25, 2019. Back in 2005 I had the privilege — and great pleasure — of interviewing Fern, best known in his home country as the founding leader of the Royal Canadian Air Force's trailblazing Golden Hawks formation aerobatic display team. We met at Lee Bottom Flying Field in Indiana, USA, where he was a regular visitor to the annual Wood, Fabric & Tailwheels Fly-in.

With his Globe Swift parked in the paddock outside, Fern, softly spoken and ever-willing to discuss anything and everything connected with aviation, devoted several hours to a wide-ranging conversation about his flying career. During our conversation he demonstrated his passion for flying of all kinds, from spine-cracking formation aerobatics in state-of-the-art jet fighters to the rather more sedate glider-towing for students he later enjoyed. His

ABOVE Fern Villeneuve during his leadership of the Royal Canadian Air Force's Golden Hawks formation aerobatic display team, which he established in 1959. Joseph Armand Gerard Fernand "Fern" Villeneuve was born in Gatineau, Quebec, on July 2, 1927, and joined the RCAF in 1950. **OPPOSITE PAGE** Fern, aged 78, with his Globe Swift C-GLYN (in honour of his wife Lynda), at Lee Bottom Flying Field, Indiana, USA, in September 2005. NICK STROUD





LARRY MILBERRY COLLECTION

ABOVE *The type that started it all — in 1944 Fern was at an Air Cadets camp when he was given his first flight experience; a short trip in an RCAF Avro Anson. This example, Yeadon-built Anson I serial 6302, was one of many supplied to the Canadians during 1940–41 and operated with the RCAF's No 2 Training Command during 1943–44.*

dedication to precision in all aspects of flying were much in evidence during our always-instructive flights together, one of the more memorable being a Chipmunk workout in which he repeated a loop until it was exactly the shape he wanted it to be — leaving this relative aerobatic novice in the back seat a little green about the gills . . .

For one reason or another, the interview was never published, and it is with a mix of sadness and happy recollection for me that we present the first part of it here, taking us from his school days up to the formation of the Golden Hawks in 1959. He will be much missed. **NICK STROUD**

NS: Fern, what's your first aviation memory?

FFV: I lived quite far from the city [Gatineau, Quebec] and I must have been about eight or nine, and this aircraft flew over. We thought it was going to land in the field over yonder so we ran over there to go see it. It didn't land but came back over where we were in the first place. We kept running for about an hour back and forth. I don't think he ever intended to land, but it got my interest all fired up and I decided that I wanted to fly a lot in my lifetime.

It was an interest that was really fostered by World War Two, because those were my teenage years. I was 12 in 1939 and 18 in 1945 and all through those years there was a considerable amount of flying going on. By that time we had moved to Ottawa. There was a big flying school there which had Harvards flying around all the time, and we used to bicycle to the airport to watch them. But you couldn't learn to fly as a civilian because there was no civil flying during the war. I couldn't wait to be 18, because I'd watch the news and read the newspapers with all these fighter pilots flying Spitfires and Mustangs, and that was what I wanted to do. The war ended two months before my 18th birthday, but I was determined to be in aviation.

I was still in high school so I worked in the summer holidays and then, in 1946, I decided I should learn to fly and went out to the airport. There was a flying club there, but there were also two other flying schools and the flying club was a little expensive. They used Tiger Moths and that's what I wanted to fly, but the cost discouraged me from flying there. So I went down the airport road, and on the other side was a school flying Piper J-3s and I guess they were trying to get business. They welcomed me, and the charge was \$11 an hour for dual and \$9 for solo. They said, "If you need some training that you can't afford today, we'll charge you".

When did you first leave the ground in an aeroplane?

I said to one of my friends in school, "When I grow up, I'm going to fly". He said, "If you're so interested in flying why aren't you in the Air Cadets?" and I said "Air Cadets?". I found out there was an Air Cadets maintenance squadron but it was at the other end of the city. So I went there and joined; that would have been 1942. In 1944 I went to a cadet camp and we did a lot of drill and we had lectures in airmanship and theory of flight and more drills, but they did give us a familiarisation flight. My first flight was that summer in the back of an Anson at Mountain View [near Trenton, Ontario].

The first time I lifted off the ground I was sitting on the floor in the back of this Anson looking out of the window. I remember this line-up by the hangar, all these cadets waiting their turn, and they had a daisy chain of Ansons just doing this large circuit. They had about four of them; it would pull up, they'd open the door and four cadets would get out and four more would get in, they'd close the door, and they would taxi off, take off and do a big circuit.

Did it match your expectations? Did you think this is definitely for me?



Absolutely, just fabulous, this is what I wanted. And so I studied aviation-related matters very much. In our English class we had to read a book a month and report on it, so I'd read technical books. In 1945 I went to cadet camp again and got a flight in a [Fairchild] Cornell. The war ended and in 1946 I worked between the school years, and my parents reluctantly agreed that I could spend my money on flying and that's what I did.

There was no aviation in your family before that?

Not at all. My father wasn't keen on flying. When I finally got a pilot's licence and had the qualifications to carry a passenger, I asked him if he would be willing to be my first passenger; he said "OK, we'll do that". We went up to the field and, of course, the J-3 was like a Tiger Moth, you flew it from the back seat. So we walked out to the aircraft and he looked at the back seat and started to get in. I said "No, you sit in the front, the back is where I fly it from". He said "I'm not getting in the front," and I said "you have to, this is where I fly it from". So I took him up flying and he looked at it all and came down and that was the first and last time he was in the air.

He never flew again after that?

No. I suppose it doesn't say much for the flying! I took my mother flying several times but my Dad, he'd always say "I don't mind flying as long as I can keep one foot on the ground".

Anyway, I got a commercial pilot's licence and went looking for work, but in 1948-49 it was only a few years after the war and there was a lot of wartime pilots with a lot of experience taking all the flying jobs. For four years I spent just about everything I made on flying, to get the time and licences. I even did a little skydiving because I thought, if I'm flying I should know how to operate a parachute, so I did some of that. I only did five jumps but at that point I thought "that's enough, I think I know all I need to know about that". I enjoyed it, but after the first one it doesn't have the thrill anymore. After doing it, the unknown, the extreme tension that you put yourself under, I remember I felt like I'd been shovelling coal all day, tired.

So that was my introduction to aviation. I couldn't get any work, but when the situation in Europe deteriorated and Nato was formed, Canada decided to put 12 squadrons of fighters in Europe as a part of the defence of the West. The RCAF started recruiting and I thought, I can't get a job flying, but these people will pay me to fly, so I thought I'd join the Air Force, and so I did.

That first solo ...

MY FIRST SOLO was in a Piper J-3 Cub.

When I first started learning to fly I could only buy a half-hour of flying at a time, which I did so often that my instructor lost mental track of how much time I had. One day we went up and did the usual training and came down after about half an hour. He said "Do you think you can afford another ten minutes?" I said, "If you think I need another ten minutes, then yeah". He said, "If you can't afford it, you can charge it," so I said, "I'll have to go a little leaner this week, but, yes, I can afford another ten minutes. What do you want to do?" He climbed out and said, "Away you go"; and I thought, you're kidding me . . .

I took off and flew a circuit and landed. There was no radio so he stood by the runway, and when I landed, he climbed aboard and we taxied across the field to the hangar. We went up to the office, he made up my bill and I got my money out. He said, "OK, how much time do you have now?" I said "Let's see, with today's training that'll give me 3hr 40min". He said, "WHAT? If I'd known you had so little time, I wouldn't have sent you up alone". I said, "That's not what it's based on, is it?" He said "Well, no, but people don't normally go solo 'til about 8hr, at least".

The licence test was done in December 1946 and my licence was issued just before the New Year. After that I kept flying because at that time you were not allowed to carry passengers; you could qualify for a licence but you weren't allowed to carry passengers until you had 25 hours as pilot in command, so I set about building up my solo time. The military wasn't really building up yet, they weren't recruiting, so I was working more towards commercial flying, more maybe bush than airline flying. So I worked up to a commercial licence, which I had when the RCAF started to build up its recruiting campaign. A couple of friends had joined up and I thought, why don't I do that . . . ? **FV**

Did the military lifestyle appeal? Some people are daunted by that.

I had spent three years with the Air Cadets, which I had enjoyed. Marching to a band, to me is as good as dancing; it has a beat and I enjoyed that very much. And of course in the Cadets we had a great drill team and we drilled in competitions against squadrons. So going into the military was relatively easy after that.

What year did you join up?

1950. Just when Canada was acquiring F-86s, which were being built in Montreal. We had squadrons equipped with Vampires and P-51 Mustangs. At that time the military did not recognise your civilian flying at all, so you were



ABOVE Fern acquired his Private Pilot Licence in late 1946 and his Commercial Pilot Licence two years later. Paid flying work, however, was hard to find, and in 1950 he joined the RCAF, with which he trained initially on the trusty North American Harvard. This example, Harvard IV serial 20439, was built by Canadian Car & Foundry in Ontario.

put on a course alongside individuals who had no flying experience whatever. And you went through the same requirements, like a sausage machine. Our basic training was on Harvards right off the bat, so I had a great time because, already having a fair amount of flying experience, I was introduced to three new things: aerobatics, instrument flying and formation flying, so I considered that it was as easy a course as I could get, because I didn't have to work half as hard as these other fellows.

On graduation we stated our preference for what we wanted to do, but got sent where they needed pilots. But they did try to accommodate you. I was fortunate. I wanted to go on fighters, and there was a push then because they had squadrons to fill in Europe.

What was the conversion process from training types to a Vampire or Sabre?

We trained on the Harvard, after which we were given some instrument flying and some twin training. We had Beech 18s and we flew those for six weeks, and then we got our Wings. Then we went to an armament school which used Harvards, and we did some rocket firing and dive-bombing. Then we went to the Operational Training Unit which had Mk 3 Vampires, all single-seaters, no duals. There we got pretty good groundschool lectures for about a week to learn all the systems. There were lectures by pilots on how the aircraft handled and what to look out for, speeds to fly and throttle-handling, before they gave you a couple of rides in a Harvard. The first was to give you a local area

familiarisation flight; if you were going to be in a new area they made you shoot approaches at about 100 m.p.h. [160km/h] down to the runway, to give you a feeling for the jet's higher speed across the fence and down the runway. And then you went out there and strapped into this Vampire and started the engine; they patted you on the head and said, "Have a good flight" — and off you went. It was very exhilarating. Your first jet flight and you're on your own.

Converting from an instant-response piston engine to a jet that required spooling-up time must have required a new way of thinking.

Very much so. Our Vampires [F.3s] were quite primitive. The throttle had to be moved slowly. They really pounded that into us — move the throttle very slowly. And close it very, very slowly. If you didn't, the engine would flame out and we had no means of restarting it. The aircraft had no ejection seat.

The training didn't last all that long, being only a three-month course. I got about 55hr on it, including one night flight. Then I volunteered to be posted to a Mustang squadron. We had F-86 squadrons at the time and people said, "Why are you doing that?"; I said "Those [Mustangs] aren't going to be around much longer but the Sabres will be around for a long time". It didn't work out, however. They needed to fill the '86 squadrons, so I was assigned to an '86 unit. It wasn't really a mistake — I was just sorry to have missed flying the World War Two fighter that had so much motivated me to start flying. I did get a chance to fly one about three years



ABOVE From training on piston-engined Harvards and Beech 18s, Fern graduated on to jets with the de Havilland Vampire, of which a total of 86 English Electric-built single-seat F.3s were acquired by the RCAF during 1948–49. There were no two-seat dual instruction variants for RCAF pilots; their first experience of jet flying had to be solo.

later, which by then was quite a rare thing to do.

Anyway, I went to an '86 squadron and they had the same routine. A whole week of ground-school; you had to learn the hydraulic system, electric system, all the fuel systems etc. Then they took you out and you started the engine and shut it down. You got another local familiarisation flight in a Harvard, and then once you had the Sabre running, they patted you on the head and you went flying in it. The significant thing I remember is climbing to altitude at Mach 0.84 — in the Vampire the limiting Mach number was 0.78 and here I am *climbing* at a higher speed than the Vampire would ever be allowed to do.

A "buddy system" was used on this first flight, whereby another pilot would follow you to render any assistance. We didn't do that on the Vampire for some reason, you were up on your own. But on the Sabre squadron they assigned someone as your monitor pilot, who would accompany you in an '86 for the first three or four flights. Then you went through the little exercises laid out — climb to 20,000ft [6,100m], make turns at various speeds. Later, at the very end of your training, you had to climb the aircraft to about 40,000ft [12,200m] and then dive it straight down with full power on to go supersonic. It was very thrilling of course, and is prohibited today because it makes that double-bang sound on the ground, which was heard so much during the early 1950s.

I went to my first Sabre squadron, No 441, in Montreal in October 1951, and by the first week of February 1952 I was on a steamship, *The Empress of France*, bound for England. Our

aircraft had been shipped previously on a Canadian Navy aircraft carrier [*HMCS Magnificent*]. The first two squadrons that went to North Luffenham [in Rutland] were Nos 441 and 410, which was the first. They went over in the fall of 1951 on the aircraft carrier with enough aircraft for them and 441 Sqn. The third squadron to make up No 1 Wing RCAF at North Luffenham was 439 Sqn and they flew over. The arrangements for these things are beyond me; I wasn't aware of what kind of decisions the RCAF were making to send us by ship as opposed to flying. I think the Americans provided a fair amount of support on this because they were ferrying aircraft over to Europe from America. After that the squadrons flew their own aircraft over; the next Wing went to one of the bases in Germany. We had two bases in Germany and two in France.

The policy at the time was that if you were married you took your family to England, where you would spend a three-year tour. If you were single your tour was for two years. So I spent two years in England with 441 Sqn.

It was during this time that the formation aerobatics idea was first put into practice — was that your idea?

I wasn't the only one, but I was one of the first [to suggest it]. We were doing formation flying and we were doing aerobatics quite a bit, as well as simulated air fighting. And so it was natural to think well, if I can do this loop and I can fly formation, why can't I do a loop in formation? And so I talked with other pilots; "I'd like to do this", and the other fella says, "me too" . . .



ABOVE A pair of Canadair Sabre Mk 2s of the RCAF's No 441 Sqn up on a sortie from North Luffenham during No 1 Fighter Wing's tenure at the airfield in Rutland, the first Canadian Nato base in Europe when the RCAF arrived in 1951. Although Fern referred to flying the F-86 throughout the interview, all the Sabres he flew were Canadair-built.

The Blue Angels and the USAF had done a bit at that point. I believe there might have even been a team in Europe but it was always a secondary duty, not a primary duty for them. The Blue Angels was a primary assignment. The US Navy started that team back in 1946, straight after the war.

It demonstrated to the public what the aircraft and pilots could do. It was a great attraction and airshows are still always an exciting event. It was a way of getting people's interest, so we wanted to do it. At that time it was still not frowned upon, the squadron CO could authorise it.

Three of us went to the CO [Sqn Ldr A.R. MacKenzie] and said we would like to do some formation aerobatics, can we have your authority? "Well, I suppose so", and we got permission to do it. If we all happened to be flying at the same time and our mission, whatever we were doing, was completed, we were authorised to do some formation and some aerobatics. Among ourselves we said we'd like Gar [Fg Off Gar Brine] to lead, and [Fg Offs] Ralph Annis, Jean Gaudry and myself formed the rest of the team.

So it was a four-aircraft team?

It was a four-ship and we did the basic manoeuvres — a roll and a loop — and then some variations of this, and we tried changing formation on top of a loop. You go into it in one clear diamond and at the top of it you go into a

line astern and come down; that was a manoeuvre we did in all of our formations, including later with the Golden Hawks. We did a loop with the Hawks where we'd go into the box [formation] and change to line astern on top, complete the loop in line astern, start the next loop in line astern, and change down to box again. So we worked that on the squadron.

When you were working the routines out, did you do it on a piece of paper first? You'd have to brief each other very carefully, presumably.

Not only that, you did it with two aircraft first and didn't put a third one in there right away, because that individual would also have to do it as a two-'plane. Then the fourth individual would also do it as a two-'plane. All four of you would then have had some two-'plane experience before going to a three-'plane, then all of you would get three-'plane experience. Then all of you would get to where you could perform the four-'plane.

Would you all take specific roles each time or did you make it so that you were all able to do everyone's job?

We tried to stay pretty much in position. Gar Brine was our leader and I was on his right wing; Ralph was on his left wing and Jean was in the box. We did a few shows in England and at Luffenham, when the Duke [of Edinburgh] came to visit [on May 21, 1953]. Later on we



MIKE HOOKS

ABOVE *Flying the flag for Canada — gleaming in their bare-metal finishes and adorned with the unit's distinctive chequerboard fuselage stripes and fin flashes, a pair of Sabre Mk 2s of No 441 Sqn RCAF are photographed from the shadow of a Handley Page Hastings at the Queen's Coronation Review of the RAF at Odiham on July 15, 1953.*

were doing pretty well and two of our pilots got transferred; Gar got transferred back to Canada and Ralph got transferred to Zweibrücken. By then a couple of other pilots had developed an interest, wanted to get in on it and so it was decided that I should take the lead. That's when I started leading. I took the lead and [Fg Offs] Norm Ronaasen and Bob Haverstock came on to the team and Jean Gaudry, who had been flying the box, stayed in the box. And so I ended up leading the 441 team.

Did a lot of pilots ask to join?

Quite a few people were interested. Those that were married didn't want to make their wives unhappy by saying that they had volunteered to do formation aerobatics. Other than Gar, all of us were single at that time. Ralph got married sometime while there but Jean and I and Norm Ronaasen and Bob Haverstock were single. So we did this for a while, until my two years were up and I got transferred back to Canada to join 431 Sqn at Bagotville.

During that time with 441 not only were you doing the formation aerobatics but all the exercises of the "day job" too?

Oh yes; that aerobatic stuff was very much a secondary task. Later, when we started doing the odd show, they would allow us a flight or two to practise, but we didn't get very much practice.

So you'd be flying in exercises like Ardent, Chronicle and Fabulous, against the best of the British air-defence system?

Yes, Meteors, Venoms and Canberras. The latter flew very high and very fast but we were able to catch them. Our problem was that it took us a long time to get up there and to close in. We wouldn't have had a hope in a Vampire or Meteor. Even at its top speed the Meteor wasn't as fast as the Canberra. But we could cruise in the '86 at full power and at 40,000ft you could run it over Mach 0.9, so you could catch up. But you had a very small closing speed; you'd need to be sent the intercept with a lot of lead so you could catch it before you ran out of fuel or ran out of range.

We also did a lot of what we called "Rat and Terrier" exercises [in conjunction with the Royal Observer Corps]. They were mostly broadcast intercepts. You'd be listening to a controller who would report a target over a certain area, heading in a certain direction. You had your map and you knew where you were and you'd figure out where this target was and which way it was heading and you'd try to figure out an intercept angle. We did a lot of low flying in those, stay right down there, 200–300ft [60–90m] above the ground. Trying to figure out angles to intercept other aircraft. We enjoyed those, but then I guess most pilots enjoy low flying.

Most of the time, when there was no exercise on and we were flying, we were either sent to do



ABOVE Sabre Mk 2 19172 of No 441 Sqn with the airbrakes and leading-edge slats extended. On May 21, 1953, HRH the Duke of Edinburgh visited North Luffenham, RCAF magazine *The Talepipe* noting “a beautiful display of precision flying in the form of a formation aerobatics team made up of Fg Offs Brine, Villeneuve, Annis and Gaudry”.

intercepts or air-fighting training. But every once in a while you’d get signed out and your exercise was “Targets of Opportunity”. You’d go up and roam the sky and look for anybody. The Americans were flying [Boeing] B-50s, and I remember doing a lot of exercises against them. Our preferred attack was an overhead, when we’d go over the top of them. It was like attacking a ground target; we would attack going down. They didn’t like those very much. We would trap the thing and then fly behind it and swoop right through and sometimes they complained that we were a little *too* close. They weren’t sure if you were going to miss them.

We had cine cameras. They took a film through the gunsight and it would show your gunsight and your gunsight reference and the target. It would be developed and run through a projector and they would say whether you got a kill or not. Not only did you have to have the pipper on the target but you also had to feed the right range information in by adding the circle around the sight to fit the wingspan of the aircraft. If you gave it the wrong range then your trajectory wouldn’t be right, and it wouldn’t be called a successful hit.

We did some air-to-air firing too. We would tow a banner — I think it was 10ft [3m] wide and 30ft [9m] long — and fly out over The Wash. There was a range, a recognised range, and we’d go back and forth firing live ammo at this target. The aircraft would tow this target back to the field and drop it. Several people could fire at the same time because they put coloured wax on the tip of the bullet and that would leave a mark

when it went through the banner. So you would count the reds and the greens and it would tell you how many hits you got. They would only load two guns and put 100 rounds in each one and you’d score yourself out of 200.

It was great fun; the kind of thing you would have to pay to go out and enjoy nowadays. And yet we felt satisfaction knowing we were there as a deterrent to pressure from the East. The Korean War was on and F-86s were fighting MiGs in Korea and I guess the West was concerned that the Russians might start a second front or politically try to push their weight around.

Canada was committed to providing some presence in Korea . . .

Yes, Canada agreed to send pilots over there but we only had two pilots at any one time. There were two Canadian pilots flying in Korea throughout the Korean War. Most of us volunteered to do it, but they made a listing and your name went on there in a pecking order, so the only people that went over there were those that got near the top.

How long would a tour of Korea be?

I believe it was three months or 50 missions, whichever came first. The Americans were training a lot of pilots there, so they didn’t give away the missions easily. Most Canadian pilots would never make it to 50 missions until their three months were up anyway. Because there were only two there at any one time, I believe we



ABOVE The Avro Canada CF-100 was developed as an indigenous two-seat long-range all-weather interceptor, the twin-Rolls-Royce Avon-powered prototype making its first flight on January 19, 1950. Production aircraft were fitted with Avro Orenda engines and this Mk 4B, 18322, participated in the SBAC show at Farnborough in 1955.

had 12 RCAF pilots who saw action in Korea.

At Luffenham we all put our names in; the base commander went, the group captain went and when he came back the base operations officer went and did a tour in Korea. When he came back, my CO, Sqn Ldr MacKenzie, never completed his tour because, I believe it was his third or fourth mission, he got shot down. The next one to go was the CO of 439 Sqn and when he came back, the CO of 410 Sqn went and while he was over there, the war ended. So we had all the very top pilots on the base go, but us young ones didn't get a chance to go.

Would you have liked to have gone to Korea?

Well, who says when you're 24 or 25 and flying the best fighter in the world, that you're not out of your right mind? So yes, I wanted to do that.

After North Luffenham you went back to Bagotville?

At that time Canada had committed itself to Norad [North American Air Defence system] and in our agreement with the Americans we were to provide about 12 or 14 squadrons of interceptors across our northern perimeter. The fighter of choice was the CF-100 being manufactured by Avro in Toronto. But the production line was delayed and they could not meet the initial plan for Norad. We were short of squadrons, and so they decided that, in the interim, they would put an F-86 squadron at Bagotville because they did not have enough CF-100 units. They took six pilots tour-expired

out of Europe and six pilots straight out of the OTU in Canada, and sent us to Bagotville [in early 1954] to form an interim squadron, which was 431 Sqn. Having come from Europe I was made a Deputy Flight Commander. Our two flight commanders were tour-expired instructors from the OTU at Chatham and our CO, Sqn Ldr Burnett, just finished OTU training.

The squadron only lasted until the fall, because in September 1954 they folded the '86 squadron completely and formed a new CF-100 squadron.

Tell me about 431's Prairie Pacific activities.

When I went to Bagotville there were six of us with a couple of years' experience in Europe. They knew of my experience and we talked a lot about aerobatics and formation. Again there were pilots there who expressed a desire to do something similar. So, we approached the squadron CO and the others made a case: "Fern's got experience doing this, both in the wing position and as leader. We would like to start doing some". So he authorised us to do it.

This was a 431 Sqn initiative — just you and the others saying this is what we want to do?

Yes. And so I took the pilots up on my wing, briefed them and showed them how to do it. We'd go up and practise. [Fg Offs] Art Maskell [box], George Fulford [right wing] and Fred Rudy [left wing] were interested and I did aerobatics with them all separately and in small groups. Then we put the four together and we

RIGHT In early 1954 Fern returned to Canada to join No 431 Sqn, and by March had established a four-man formation aerobatic display team, practising extensively up to the team's first official engagement at the Canadian National Exhibition in Toronto on June 12 that year. Seen here at the show beside one of the Sabre 2s, all given "Indian head" insignia and the legend Iroquois are Fern (leader, kneeling) and standing, from left to right, Rod MacDonald (right wing), Art Maskell (box) and Fred Rudy (left wing).

tried to work up a little bit of a routine. Then tasking came to provide an airshow somewhere with a display. The CO said, "I might as well send you guys, you're doing formation all the time anyway". So we went and did it and the RCAF decided to run a public-relations exercise across the prairies.

Jets were still relatively new at the time and the RCAF did not have any jet aircraft based west of North Bay [Ontario] until you got to Vancouver Island [British Columbia], where Comox was. So they wanted to show the people in the prairies what jets were like, as they were going to put T-33s into training schools out there. So they organised this tour that they called *Prairie Pacific*. It was demonstrating jet aircraft through the Canadian prairies all the way to the Pacific.

They tasked a squadron of CF-100s in Montreal to be a part of it and Central Flying School in Trenton had a team of T-33 guys that had been authorised by its CO, as we had been in Bagotville by our squadron CO, to do formation aerobatics, and they became part of the task. So when we assembled in Winnipeg for *Prairie Pacific* we had a Sabre amateur team, a T-33 team and the CF-100 guys did a lot of formation but hadn't done any formation aerobatics as such.

The show consisted of a flypast to the east of Winnipeg with a routing that went over this town, that town and another one and back. The CF-100s would lead and we would follow in the Sabres, and the T-33s would bring up the rear about a mile apart and fly over the same cities at about 1,000ft [300m]. One day we would fly out to the east, the next day to the south, next to the west, before a big show at the base we were working from. The CF-100s would put on a demonstration of formation flying from box formation to line astern to echelon. They had a young CF-100 pilot who liked to demonstrate the aircraft, and he was eventually authorised to do some solo aerobatics. Then we would come in and we would do our Sabre aerobatics.

It wasn't a long show, but while it was on it was fairly active. I led the team and we did our little manoeuvres; probably only about five manoeuvres or so — a roll and a couple of loops followed by a bomb-burst, and then I would come in and do some solo manoeuvres, because I'd done a lot of solo shows as well. There are manoeuvres that you can do solo that you can't



VIA DAN DEMPSEY

do in formation, like point rolls and spinning. I used to do a spin — which you can't do in formation. So I did a little bit of that and the T-33s did a formation show.

How long did Prairie Pacific last?

We were gone about a month and we ended up doing the Canadian National Exhibition International Airshow [CNE] in 1954. It was the same teams that did *Prairie Pacific* but it was after that programme was over. We returned to Bagotville after the CNE and within a couple of weeks the squadron was stood down.

Because it was only an interim squadron . . .

They were sending in CF-100s and CF-100 pilots. The pilots that had come from the OTU were all assigned to Europe. The six of us that had already been to Europe all went to Training Command for instructor training. At the time the policy was that you initially instructed on Harvards because they wanted experienced instructors only on T-33s, for advanced flying.

The RCAF was in a two-stage training system then; Harvards and T-33s. Two of our pilots went straight to RCAF Macdonald [near Portage La Prairie in Manitoba] which was a gunnery school. They were instructing without instructor ratings because the pilots that went there already had their Wings — they got them in advanced training before going on for weapons training — so two of our pilots went there as instructors.

The rest of us became Harvard instructors. I



LEFT After his brief tenure with No 431 Sqn, Fern was sent on an instructor's course for the Harvard, before volunteering to become an instructor on the CT-133 Silver Star, a Canadair-built version of the Lockheed T-33. After a period instructing at Portage La Prairie, Fern was posted to the Central Flying School to evaluate and instruct the instructors, accruing a great deal of experience on the Silver Star, another type he enjoyed pushing to its limits.

LARRY MILBERRY COLLECTION



was sent to Trenton, where the flying instructor school was, and took the Harvard instructor's course. They were bringing in pilots from all walks of life; from transports, search-and-rescue, even some helicopter pilots, to complete a tour of instructing.

The course was fairly long in my opinion because they had to get all the students current on the Harvard. Some of us didn't need much to do that, but others required a little more, so you spent a good portion of your time getting current in the Harvard and getting experience in the back seat. Flying a Harvard from the back seat means that you're almost flying blind. Somehow or other they realised they were getting pilots back from Europe with a considerable amount of jet time and that maybe Training Command was missing the boat.

The advanced flying instructors they had at the time had no jet time; we had experience instructing, so they decided maybe they should include some people with jet experience. So about a week before I finished the instructor's course on the Harvard they came along and said to our course of about 25 pilots, 13 of you have jet experience; if you wish to switch to instructing on jets instead of Harvards, you can volunteer to do so. All but one of the 13 did. They insisted that we go on the advanced flying training instructor's course. So I spent another three months at Trenton on T-33s. That took me right up to the summer of 1955 when I went to Portage La Prairie to instruct.

Those were the years when you joined the RCAF on what they called the short-service

commission, in which you had five years as a commissioned officer. The one lad who didn't volunteer to go instructing on jets with us said, "piston experience is far more important to me because I'm going to be out on civvy street looking for a job".

The rest of us said we enjoy jet flying so much, we would sooner do that and take our chances; in the long run it turned out jet experience was just as good as piston experience. However, I got a permanent commission, so I stayed in the RCAF until my retirement at 55.

I was going into instructing and I thought I might as well do this as well as I can, so I flew everything. I enjoyed flying, so I did a lot. We had a lot of students because we were training a lot of Nato air forces. I trained Belgians, Dutch and even some RAF pilots while instructing.

Being sort of aggressive and wanting to get ahead, I went from my provisional C category instructor rating to a B Category, then A2 and finally A1. Within 18 months I had an A1 instructor's category. I was reassigned to the Central Flying School which did all the standardisation across the RCAF, because it had a Multi-engine Flight, a Basic Flight, a Navigation Flight and a Jet Flight. I was assigned to the Jet Flight and for the next two years I was doing instructor evaluations, category upgrading, checking the standard at the student level by flying with students. We visited the Flying Instructor Schools at Portage La Prairie, Gimli and Macdonald; we had those three bases to do category instructor ratings and evaluations.

That's when I got most of my T-33 time. It's a beautiful machine. It has one slight flaw in that the fin and rudder is not quite large enough, so if you tail-slide it, it can double end over end, because it needs a fair amount of speed before it will stabilise. But it had great range and reliability with the [Rolls-Royce] Nene engine. I stayed at the Central Flying School for two very happy years.



NEXT TIME Fern recalls the formation of the Golden Hawks and the Sabre accident that earned him the Air Force Cross — and nearly cost him his life

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Australia's Department of Civil Aviation in Portuguese Timor, 1941-42: Part 2

FROM FLYING TO SPYING

In the concluding half of his series on one of the more bizarre episodes in the history of Australia's Department of Civil Aviation, **PHIL VABRE** explains how a single rather reluctant DCA officer facilitated the bloodless occupation of a neighbouring country — Portuguese Timor — in the days leading up to Pearl Harbor, only for the tables to turn somewhat . . .

AS 1941 DREW on and tensions with Japan amplified daily, the Australian government became increasingly concerned about the possibility of a Japanese occupation of Portuguese Timor. This, it was felt, could arise in one of three ways: "(a) German occupation of Portugal, encouraging Japan to take Portuguese Timor under 'protective custody'; (b) the possibility at any time in existing circumstances of a Japanese landing in Timor with little or no warning; (c) in the event of war with Japan."¹ On September 8, Arthur Fadden, briefly Australian Prime Minister following the resignation of Robert Menzies,² cabled the British Secretary of State for Dominion Affairs proposing that at the earliest opportunity the governments of the UK, the Netherlands and the Commonwealth should discuss the possibility of a pre-emptive occupation of Portuguese Timor.³

In addition to reporting extensively on trade

and political issues, on September 30 David Ross, the Australian Department of Civil Aviation's representative in Dili, the capital of Portuguese Timor, reported the contents of an intercepted telegram addressed to Mr Kawabuti, the senior *Dai Nippon Kōkū KK* (Imperial Japanese Airways) official in Dili.⁴ The telegram stated that another proving flight by the Japanese flying-boat would be made from Palau to Dili on October 11. This time the aircraft would bring 16 passengers, in addition to the normal crew of seven. The purpose of this delegation, unknown to Ross at the time, was negotiation directly with the colony's government regarding an agreement to begin scheduled air services, as Japanese requests had been stalled for some time in Lisbon.⁵

Ross also reported that the Portuguese government in Lisbon had agreed to the appointment of a Japanese Consul in Dili. This development, Ross felt, left him in a difficult position, as he explained:

With the tropical-rainforested mountains rising in the background, Kawanishi H6K2-L J-BFOY, named Sazanami, of Dai Nippon Kōkū KK (Imperial Japanese Airways), bobs in Dili harbour during the third Japanese proving flight to Portuguese Timor in January 1941. At right in the distance is the tender Neishi Maru, sent from Palau in support. CAHS / IVAN HODDER COLLECTION



RIGHT David Ross visited Portuguese Timor in 1939 as the Superintendent of Flying Operations for the Department of Civil Aviation (DCA) and again in late 1940, and by 1941 was the DCA's full-time representative in Dili, the capital. It was far from a glamorous assignment, however. CAHS COLLECTION

"Against this influence, exerted through no less [sic] than 12 permanent residents, the consul, and the bunch of officials expected in the flying-boat already mentioned, we have myself — a technical aviation expert masquerading as a general government representative — and Whittaker, a naval intelligence officer, masquerading as a civil aviation officer."

Ross went on, in a rather despairing tone:

"The position as now existing is impossible so far as opposition to Japanese penetration is concerned, and the underhand system of gleaning news and intelligence by unauthorised perusal of radiograms leaves very much to be desired. We must accept the fact that Japanese penetration in Timor cannot be satisfactorily prevented with the means now available. I am thoroughly disgusted with the existing situation; I receive no advice of any political or trade developments concerning Portugal and her colonies, and merely act here as a flying-boat control officer, and an unofficial and very minor representative of the Government of the Commonwealth.

"I am now convinced that there is nothing more which I can do to minimise effectively the progress being made by the Japanese in the extension of their southern penetration policy, and I ask that I be relieved at the expiration of the term which I volunteered to serve here . . . I would appreciate advice by signal of the date when a relief may be expected."

Unfortunately for him, David Ross was to be in for a disappointment.



Like it or lump it

On October 17, 1941, the UK Secretary of State for Dominion Affairs, Viscount Cranborne, cabled the Australian government with a recommendation that, in view of the appointment of a Japanese Consul, the status of Ross should be elevated to British Consul, at least for a few months. In a rather condescending manner, Cranborne stated that the UK was having trouble finding a diplomat to post to Dili because: "(a) there is not enough work to occupy the full time of a career Consular Officer with the consequent risk of deterioration of the Officer, as the place lacks any amenities for alternative occupations; (b)





ABOVE In the late 1930s and early 1940s Portuguese Timor was far from wealthy and largely undeveloped. This Dili street scene was taken by DCA Radio Inspector Ivan Hodder in early 1941 during the establishment of the Qantas service. Just visible in the middle of the road are Qantas Traffic Officers Doug Laurie and Bill Neilson.

climatic and other conditions of the post make it undesirable for an Officer to remain long in Dili. Temporary appointment of Ross would thus for the time being solve the difficulties of reliefs; (c) such work as there is is largely concerned with aviation, for which Ross has obvious advantages over a Career Consular Officer; (d) the Governor of Portuguese Timor is understood to be specially favourably disposed towards Commonwealth citizens and Ross himself is *persona grata*; (e) the difficulty of finding suitable accommodation for a Consular Officer would be avoided if Ross were to be appointed since he could remain in the house he now uses".⁶ While points (c) and (d) are fair enough, the others show scant regard for Ross who was, at that time, a senior DCA officer.

Despite Ross's wish to return home, the Commonwealth government agreed with the British proposal and Ross was officially appointed Consul for Great Britain and Representative for the Commonwealth in Dili on November 5.⁷

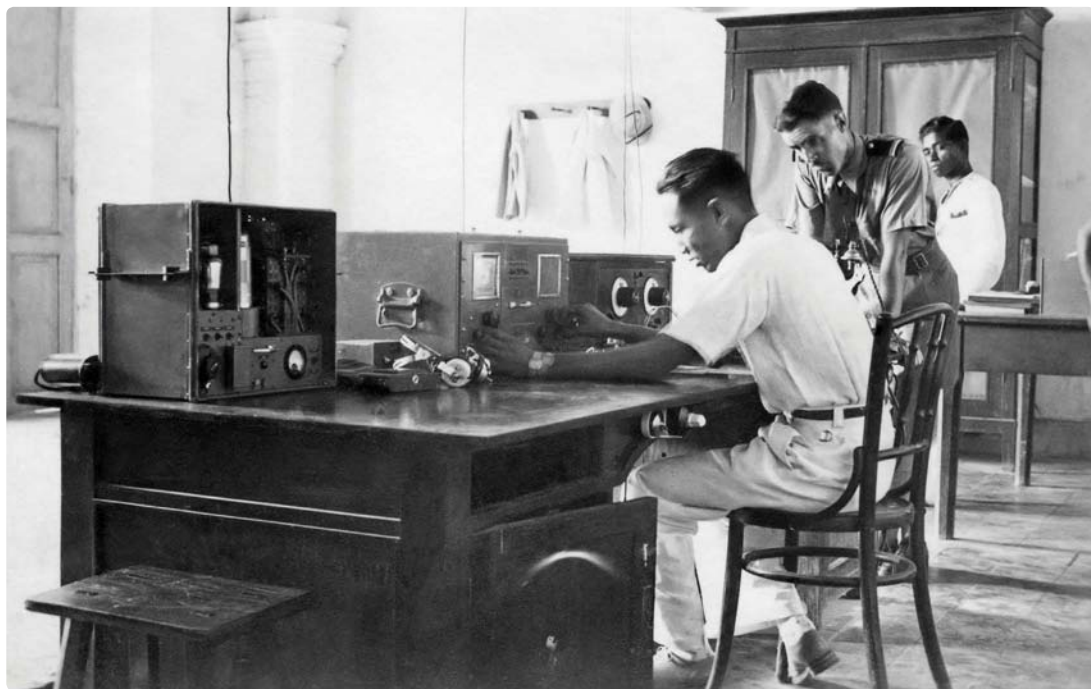
By mid-October 1941, Dai Nippon Kōkū KK had completed its six proving flights to Dili, with the final aircraft due to depart Dili for return to Japan on November 9.⁸ After 15 months of negotiations the Japanese government also succeeded in coercing the Portuguese government into agreeing to a regular service between Yokohama and Dili via Palau. When the news was announced at the beginning of November, the basis for the Japanese service was denounced by Qantas's Hudson Fysh, who described Dili as

Japan's new listening post in the South Pacific and said that "beyond giving [Japan] a bird's-eye view of what is going on in the South Seas, this post has no great commercial value . . . therefore trade cannot be the reason for the new service".⁹ However, Qantas Empire Airways Chairman Fergus McMaster was equally frank the same day in stating that the Qantas "fortnightly deviation from Koepang to Dili was made for political rather than economic reasons".¹⁰

A Dai Nippon Kōkū KK aircraft was scheduled to depart Palau on the inaugural scheduled service on November 15,¹¹ but in the event it did not operate until November 25.¹² The fare was £26 sterling, roughly equivalent to AU\$2,750 in 2018,¹³ and it was reported that, perhaps unsurprisingly, "there appears to be little interest in the booking".¹⁴ In the meantime, the Governor of Portuguese Timor was forced to deny that Japanese infiltration of the colony was occurring, stating that there were only 15 Japanese in Dili, including Consulate staff. There were, however, reports of local unrest, with 17 Chinese being detained after throwing stones at a club in which the Japanese Consul was giving an address.¹⁵

Sequel in Portuguese Timor

Such was the state of affairs, briefly, with both Qantas and Dai Nippon Kōkū KK operating scheduled if infrequent services, until December 8, 1941,¹⁶ when everything changed following Japan's attack on the US Navy fleet at Pearl Harbor,



ABOVE Local radio operator Patricio “Pat” Luz, seen here at the Aeradio station in the Dili Post Office, was a key asset in Australian espionage efforts. Controlling the only means of rapid communication with the outside world, Luz’s co-operation enabled the Australians to exchange messages freely and also intercept Japanese messages.

Hawaii, and simultaneous assaults on the British colonies of Hong Kong, Singapore and Malaya.

In the immediate aftermath of the commencement of hostilities with Japan, the strategic threat to Australia posed by the perceived Japanese encroachment in Portuguese Timor was of considerable concern to the Dutch, Australian and British governments. On December 10 Cranborne cabled the new Australian Prime Minister, John Curtin, to express the view that “it seems very important to make some immediate provision against the possibility of Japanese attack on Portuguese Timor”. Cranborne indicated that the Portuguese, officially neutral in the war, fearful for their vulnerable colony of Macao and not wanting to antagonise Japan, would not agree to Allied troops entering Portuguese Timor unless there was evidence of a threat of occupation by Japan. However, they would probably agree to authorise the Governor to request Allied assistance in the event of a threat, without reference to Lisbon.¹⁷ That same day the battleship *HMS Prince of Wales* and the battle cruiser *HMS Repulse* were sunk by Japanese aircraft off the east coast of Malaya, shattering preconceptions about the ability of British naval power to protect Australia and its strategic interests.

The following day another cable arrived from Britain informing the Australian government that the British government had received information that “the Governor General of the Netherlands East Indies [NEI]¹⁸ has authority from his

government to take necessary action for the liquidating of Japanese in Portuguese Timor and that all naval and military plans are complete”.¹⁹

By this time a small force of Australian troops known as “Sparrow Force”, consisting largely of the 8th Division’s 2/40th Battalion and a commando unit, the 2/2nd Independent Company, had been despatched to Dutch western Timor and were expected to arrive on December 12. The Australian government replied that it was “in accord with the proposal to send a combined Australian and Dutch force into Portuguese Timor to liquidate the Japanese” and that it was instructing the commander of Sparrow Force, Lt-Col William Leggatt, to send a detachment of Australians with the Dutch troops. The Commonwealth Government’s view was that Portuguese Timor should be occupied without delay, and the 2/2nd Independent Company had in fact been earmarked for that role.²⁰

On December 15 David Ross flew to Koepang for a conference with the Dutch Resident in Koepang, Mr Niebouer, and the commanders of the Australian and Dutch forces in western Timor. The conference was informed that as a result of negotiations between the British, Dutch, Australian and Portuguese governments it had been agreed that the Governor of Portuguese Timor would ask for assistance in the event of Japanese aggression against Portuguese territory. However, it seems that the Governor-General of the NEI had already decided to take



MAP BY MAGGIE NELSON

action without delay to “provide assistance” to Portuguese Timor, and events were set in motion that would create an intense diplomatic storm.²¹

The following day Ross, a key facilitator because of his relationship with the Governor of Portuguese Timor, flew back to Dili to arrange an interview with the Governor for the commanders of the Dutch and Australian troops in Timor, Lt-Col W.E.C. Detiger and Leggatt respectively, for December 17 at 0700hr. Detiger and Leggatt arrived in Dili by ship on the morning of the 17th, followed later by the bulk of the Allied troops.

Faced with the Allied occupation forces *in situ*, and with no wish to start hostilities, the Governor had little choice but to acquiesce to the Allied occupation of Portuguese Timor. This did not, however, prevent the Portuguese government protesting in strong terms to the British Ambassador in Lisbon. As a result of furious negotiations, within a month Australia’s Department of External Affairs cabled Ross to advise him that it had been agreed that the Allied troops would be withdrawn once some 800 Portuguese troop reinforcements, despatched from the Portuguese colony of Mozambique in Africa, had arrived.²²

Owing to the military situation, the Qantas

Empire Airways service through Dili was suspended on January 24.²³ Ross, justifiably alarmed at the prospect of being left alone in Dili as the sole British/Australian representative, cabled External Affairs the following day, setting out a case for his withdrawal. Minister Evatt replied the next day saying that he understood the position Ross would be in, but nevertheless felt it important that Ross remained in Dili.

The occupation of Portuguese Timor by the Australian Commandos and NEI troops of Sparrow Force lasted for two months as, meanwhile, the Japanese swept inexorably through the western Pacific and south-east Asia. On January 30, 1942, Short Empire Flying Boat G-AEUH *Corio* was shot down off western Timor by Japanese fighters, leading to the suspension of operations through Koepang and a move westward to operations between Tjilatjap, on Java’s southern coast, and Broome, in north-western Australia. On February 14, Japanese paratroopers landed on Sumatra, and on the 15th the once-impregnable fortress of Singapore surrendered, cutting off all communications from the NEI to the west.

While the Japanese had not yet landed on Java, the political and economic centre of the NEI, they acted to cut Java off from supply lines to the east,

When Qantas-operated Short S.23 Empire Flying Boat G-AEUH Corio, formerly VH-ABD (as seen here at Karumba, Queensland), was shot down by Japanese fighters off the southern coast of Dutch Timor on January 30, 1942, DCA ordered Qantas to cease operating through Timor and move operations westward (see the author’s Lost Without Trace in TAH 9).

CAHS / JOHN G. WALKER COLLECTION





through Australia to the USA, by invading Bali on February 19. The same day, Japanese carrier- and land-based aircraft mounted the first major air raid on Australian soil with a devastating attack designed to neutralise Darwin as a base for offensive military operations.

With this increasingly desperate situation for the Allies as a backdrop, during the night of February 19–20, 1942, Japanese landings took place simultaneously at Koepang and Dili. For two hours the Australian Commandos and Dutch troops fought off the Japanese at Dili, before being forced to take to the mountains of the interior, from where they would wage a year-long guerrilla war. David Ross himself was captured by the Japanese invasion force, as he recalled:

“Suddenly I heard a ‘roomp’. I looked out to sea — the house was right on the beach — and I could see a flash of light and hear the ‘roomp’ and I was trying to work out the speed of sound . . . I suddenly realised they were shellbursts, and here I was with a couple of Jap destroyers shelling me, the few buildings along the beach, one of which was my house . . . I said ‘shut up the house, I’m going up in the hills and I’m not stopping’, and I left my house and walked three or four streets.”²⁴

After lying “doggo” for a while in a nearby house, Ross gave himself up to the Japanese. As Consul, he enjoyed diplomatic status and was confined to his house but otherwise unharmed. The biggest problem was a lack of food, and Ross existed for a while on rice and unripe oranges from his garden, supplemented by peanuts and the occasional chicken bought from locals.

No uncertain terms

After about a fortnight the Japanese Consul in Dili came to see Ross. The Japanese knew that there were Australian Commandos hiding in the hills

ABOVE *In the 1940s Dili was a small and rather down-at-heel town. The largest building was the cathedral, visible in the centre of the picture directly below the “step” of the flying-boat’s float. DCA airport engineer Bill Bradfield took this photo as Empire Flying Boat Castor arrived over Dili harbour on December 29, 1940.*

near Ermera: “He said because the East Indies have surrendered, Singapore has surrendered, therefore these soldiers . . . they must surrender. If they don’t surrender they will be treated as bandits and executed”. Ross agreed to travel up into the hills to find the Aussies and pass on the Japanese demand for their surrender. He was taken to Liquica, on the coast: “I went along and went inland on a Timor pony with a woman’s saddle and hæmorrhoids — and you can’t beat that on a wet Sunday and an empty stomach”.²⁵

After a day’s walk Ross met up with a party of Australians. At a conference in the village of Hatu-Lia on March 16 Ross put the Japanese surrender proposition to the Commanding Officer of Sparrow Force, Maj Alexander Spence, and his officers. Accounts vary, but responses are said to have included, in typically Australian fashion, “Surrender be f***ed!” and “Tell the Japs to stick it up their arse!”²⁶ With these formalities out of the way, Ross was able to give out letters of credit, underwritten by the British government, which proved invaluable in enabling the Australians to purchase food and goods from the locals.

Having given his parole to the Japanese, Ross reluctantly headed back to the coast. He recalled that he “walked the last ten miles, I think; couldn’t stand the sore backside on the pony”.²⁷

The Aussie Commandos maintained a guerrilla campaign against the Japanese. Ross recalled:

“For the next four months if any Japs put their nose outside Dili they’d get one in the eye. An occasional ambush, about every fortnight. And



LEFT After returning from Timor, David Ross rejoined the RAAF as controller of all Allied non-operational air transport in Australia. After the war he rejoined DCA as Superintendent of Air Navigation, going on to be appointed Regional Director of Civil Aviation Western Australia in 1948. By his own admission, he virtually "retired" at that time, formally retiring in 1964.


awful rude letter for which I since think that if they had caught me they'd have chopped me; the Japanese were very upset. I had about 900 quid on my hands. They said here was this man and we give him this and we sent him off on a mission and he does this to us. If the Japs had won the war I don't know whether I would be a war criminal, but I'd insulted the Japanese 18th Army".³¹

Home at last

After 18 months in total on Timor, Ross was evacuated to Darwin aboard the patrol vessel *HMAS Kuru*, arriving in Darwin on July 10, 1942.³² On arrival back in Australia, Ross reported to the War Cabinet on conditions in Portuguese Timor, and then rejoined the RAAF for the duration, where he was placed in charge of all non-combat air transport operations. It is clear, though, that the experience of having been thrust into the unanticipated and unwanted roles of spy and diplomat, and then having been, as he saw it, abandoned by the Australian government in Dili, left Ross somewhat embittered.

As a civilian and Portuguese national, Pat Luz, who had been a vital part of DCA's work on the island (see Part 1), also remained in Dili, where he continued to work in the Post Office. However, his sympathies lay with the Allies and he was able to provide information to the Australian Commandos, which led to the latter, with Luz's assistance, removing the AS9 transmitter that Ivan Hodder had installed from under the noses of the Japanese. This supplemented an earlier transmitter that the Australians had cobbled together to regain contact with Australia. Pat Luz also eventually escaped to Australia, where he was taken on by DCA as a radio operator.³³

Thus ends the strangest episode in the Empire flying-boat story, in which the aircraft first became a tool in their own right of Australia's (and by extension Britain's) foreign policy, diverted on to a commercially dubious service for political reasons, and then providing a cover for espionage leading to the occupation of a neutral territory.

Although Australia was worried about the military consequences of Japanese occupation of Portuguese Timor, there is evidence that, until the Allies precipitately occupied Portuguese Timor, Japan would have been content merely to neutralise the colony and dominate it economically. The occupation of Portuguese Timor, first by the Allies and consequently by the Japanese, had merely led directly to great hardship for the East Timorese population. 

next door to my house . . . was a house occupied by Japanese officers. There must have been seven or eight of them. There was a piano there, I could see shoes and socks and eyeshades, white boxes appearing on the piano. They were the blokes who had been killed in these Australian ambushes . . . and a hospital ship came one day and took all these Japs in boxes. Our blokes killed a lot of them."²⁸

Unknown to Ross, moves were afoot on the diplomatic front to include him in an exchange of diplomatic and civilian internees between the British and Japanese governments. The Australian government refused to hand over Japanese diplomats interned in Australia at the beginning of hostilities unless the Japanese agreed to include Ross and V.G. Bowden, Australian official representative in Singapore, in the deal.

Before this exchange could take place, in June 1942 Ross was again approached by the Japanese to travel into the interior to seek the surrender of the Australian Commandos. This time, Ross determined not to return. Making contact once again, Ross ". . . found out that the troops in the mountains had made this radio set and were in contact with Darwin. [The latter] was told that I was out and they said oh well, we'd better consider whether he should go back right now.²⁹ I said I'm out, I'm staying out.³⁰ And I wrote a letter, I told the Japs I would write a letter . . . an

- 1 A.W. Fadden, Prime Minister, to Viscount Cranborne, UK Secretary of State for Dominion Affairs, Cablegram 588 CANBERRA, September 8, 1941. Australian Archives (AA) ref A981 TIMOR (PORTUGUESE) 3, i
- 2 During 1941 Menzies spent some months in Britain discussing war strategy with Churchill and other leaders. While there, his political support declined to the point that when he returned home he was forced to resign as Prime Minister. Country Party leader Arthur Fadden then took over briefly on August 29 until he, too, lost support. John Curtin, as the new Labor Prime Minister, succeeded Fadden on October 7
- 3 Fadden to Cranborne, Cablegram 588, op cit
- 4 David Ross to Lt-Col W.R. Hodgson, Secretary of Department of External Affairs, Letter DILI, September 30, 1941. AA ref A981 AUSTRALIA 248
- 5 Lord Cranborne to Commonwealth Government, Cablegram 707 LONDON, October 17, 1941, 2145hr; AA ref A981 AUSTRALIA 248. The formal Japanese request for an air-service agreement was made on June 15, 1940, according to report "No Japanese Base": *Dili Governor Says No Need For Concern in The Advertiser* (Adelaide), November 4, 1941, p8
- 6 Cranborne to Commonwealth Government, Cablegram 707 LONDON, op cit
- 7 Although Ross was officially UK Consul, he continued to receive salary and instructions from the Commonwealth
- 8 *Japanese Air Service to Timor in The Argus* (Melbourne), November 3, 1941, p1
- 9 Fysh is quoted in *Qantas Official's Comment* in the *Cairns Post*, October 17, 1941, p5
- 10 McMaster in *Qantas Beat Japan to Australia—Dili Link in The Courier-Mail* (Brisbane), October 17, 1941, p3
- 11 *Japan Timor Air Service to Open: Trouble at Dili in The Argus* (Melbourne), November 4, 1941, p5
- 12 *Japanese Timor Air Service Launched in The Courier-Mail* (Brisbane), November 4, 1941, p1
- 13 Reserve Bank of Australia Pre-Decimal Inflation Calculator, latest available calculation date (2018)
- 14 *The Argus*, November 4, 1941, op cit
- 15 *The Argus*, November 3, 1941, op cit
- 16 The war with Japan commenced on December 8, 1941, in Australia and the south-west Pacific, as they are located on the other side of the International Date Line to Hawaii
- 17 Cranborne to Curtin, Cablegram 812 LONDON, December 10, 1941, 2012hr, AA ref A981 TIMOR (PORTUGUESE) 3, i. The Australian government replied the following day agreeing that this should be put to the Portuguese government in Lisbon. On December 13 Cranborne cabled back that the Portuguese had accepted the proposal that assistance should be provided by Australian and Dutch troops in the event of a Japanese attack, and that the Governor of Portuguese Timor would be empowered to request such assistance if necessary
- 18 Jonkheer Dr A.W.L. Tjarda van Starkenborgh Stachouwer
- 19 Cranborne to Curtin, Cablegram 819 LONDON, December 11, 1941, 1824hr, AA ref A981 TIMOR (PORTUGUESE) 3, i. This use of the term "liquidate" may seem somewhat sinister; in this context it was used merely to mean "neutralise"
- 20 Commonwealth Government to Cranborne, Cablegram 797 [1] CANBERRA, December 12, 1941, AA ref A981 TIMOR (PORTUGUESE) 3, i
- 21 A report back to the UK states that the Australian government learned of the NEI Governor-General's decision through "Service channels" — undoubtedly Leggatt's report following the Koepang conference of December 15. The Australian government agreed with the Dutch action and also agreed to provide air cover for the movement of the Dutch and Australian troops from Koepang to Dili by sea. Commonwealth Government to Cranborne, Cablegram 798 [1] CANBERRA, December 16, 1941, AA ref A3196 1941, 0.21697
- 22 Department of External Affairs to David Ross, UK Consul in Dili, Radio message 2 CANBERRA, January 20, 1942, AA ref A981 TIMOR (PORTUGUESE) 3, i
- 23 Department of Civil Aviation, Report on Civil Aviation in Australia and New Guinea 1941–42: Author, Melbourne, Australia, Civil Aviation Historical Society (CAHS) collection
- 24 Interview with David Ross, First Director of Western Australia Region of DCA, transcript of interview for the Department of Aviation Historical Society by Bill Tilly and Bill Scott, 1982, CAHS collection
- 25 Ibid
- 26 Ayris, Cyril, *All the Bull's Men: 2/2nd Commando Association*, 2006, p198. See also Callinan, Bernard, *Independent Company: The Australian Army in Portuguese Timor 1941–1943*, William Heinemann, Melbourne, 1954
- 27 Interview with David Ross, op cit
- 28 Ibid
- 29 Lt-Col Hodgson, Secretary of the Department of External Affairs, advised that Ross should return to Dili. He reported that efforts were being made to include Ross in an exchange of prisoners. Meanwhile, the Minister, Dr H.V. Evatt, considered that Ross "can still render best service to Australia while he is in Timor, by remaining at Dili and acquiring all information he can about Japanese". Lt-Col W.R. Hodgson to Lt-Gen V.A.H. Sturdee, Chief of the General Staff, Teleprinter message CS 2684 CANBERRA, June 23, 1942, AA ref A981 WAR 72
- 30 Ross's signal to Australia was as follows: "Since occupation Dili have been close prisoner in house which has been looted by Japanese soldiers. For three months have been half starved owing lack of food for sale Dili and refusal Japanese allow servants search for food in surrounding country. Japanese suggest I might convey to Australian Company guarantee of proper treatment. I agreed to convey this suggestion. I did not give any indication that I would return Dili, but merely said that I would write and give the reply of the Australian Company. I do not intend returning for imprisonment in Dili and am writing to Japanese to give reply that Australians will not surrender. Do you want me to return to Australia if possible, or shall I become a fugitive and remain in this territory in hope that Japanese might evacuate Dili? Cipher books have been destroyed". Text quoted in F.G. Shedden, Secretary of the Defence Department, to Lt-Col W.R. Hodgson, Teleprinter message D2736 MELBOURNE, June 28, 1942, 0955hr, AA ref A981 WAR 72. Faced with a *fait accompli*, the Minister had no alternative but to agree to Ross being evacuated from Timor
- 31 Interview with David Ross, op cit
- 32 An interesting postscript occurred in relation to the prisoner exchange when the Japanese were forced to admit that Ross was no longer in their control. By this time Australia was aware of his whereabouts. The Japanese also could not produce Bowden, who was last heard of leaving Singapore for the NEI just before the surrender. The Australian government agreed to go ahead with the exchange, which occurred at Lourenço Marques (now Maputo), Mozambique, on August 27, 1942. After the war, it was revealed that Bowden had been captured at sea and murdered on Bangka Island, east of Sumatra
- 33 By 1943 the Australian Commandos had been evacuated from Timor and a reconnaissance force was sent back to keep an eye on the Japanese. Pat Luz subsequently returned to East Timor by submarine as radio operator to a party of Portuguese Timorese enlisted in the Australian Army as part of the Service Reconnaissance Division. This party was ambushed shortly after arriving and took to the hills where, several days later, it was surrounded and attacked. Pat Luz was the only member of the party to escape and spent the remainder of the war organising an East Timorese resistance group. Post-war Pat Luz returned to Dili, to become Aeradio Operator at the aerodrome. He later emigrated to Australia where he rejoined DCA as an Aeradio Operator. He settled in Darwin and was appointed Honorary Consul for Portuguese Timor. Pat Luz later moved to Sydney as full-time Consul



ARMCHAIR AVIATION

We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics

In Turbulent Skies: British Aviation Successes and Setbacks, 1945–1975

By Peter Reese; The History Press; 97 St George's Place, Cheltenham, Glos, GL50 3QB; 6in x 9¼in (156mm x 236mm); softback; 304 pages, illustrated; £19.99. ISBN 978-0-750993-02-9

THIS IS THE third instalment in Peter Reese's multi-volume history of the British aircraft industry; and, with only one major flaw, it is a fine survey of a very complicated 30 years of policy, technology and personality. The latter aspect is particularly well done; throughout the book are scattered lively and relevant vignettes of key individuals and their impact on the industry and its products. Some, such as Lord Brabazon of Tara and W.E.W. "Teddy" Petter, are undoubtedly "heroes"; others, such as Duncan Sandys and Denis Healey, if not outright villains, deserve the odd boo or two.

The latter was most directly involved in the cancellation of the TSR.2, which is often a touchstone of opinion about the successes and failures of UK post-1945 aerospace. Reese, I think, provides a fair judgment on both the aeroplane and its political nemesis. The politics of cancellation and the subsequent fiasco of the UK's F-111 procurement are particularly well covered. This balanced approach continues into many of the other controversies of the period, especially his descriptions of the various airliner programmes launched in the 1950s and 1960s.

Individual chapters also stand out for their able summaries of key developments, including the V-Bombers, UK guided weapons and helicopters. I was especially gratified to find a study of Farnborough and its leading personalities. This book is not a lament for the lost opportunities of UK aerospace, and there are sufficient references to the intrinsic weakness of both industry and government policy to confirm the underlying problems faced by UK aerospace between 1945 and 1960. But as a political and

economic historian of the industry, I feel these issues tend to get a little lost among the project histories. There could have been more on the rationalisation process that began to emerge in the mid-1950s and continued through until the formation of British Aerospace in the 1970s.

So where does it go wrong as a study of the period? In telling the story of the years between the 1964–65 Plowden Report and the mid-1970s, the book loses coherence. The development of Concorde and the ultimate failure of Rolls-Royce are recounted, but the essence of the mid-1960s — the onset of international collaboration — is barely covered. Of the Rolls-Royce saga or the A300 and its BAC competitors there is nary a mention; nor does the fiasco of the AFVG and the origins of the Tornado [as covered in this issue — *Ed.*] get a mention. Nor is there anything on the Heath years, the struggle to find a way back from the UK's departure from the Airbus project, the cancellation of BAC's Three-Eleven, Rolls-Royce's bailout or the struggle to launch the 146.

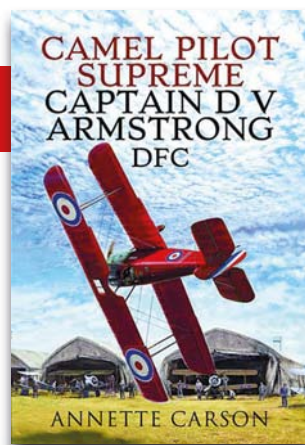
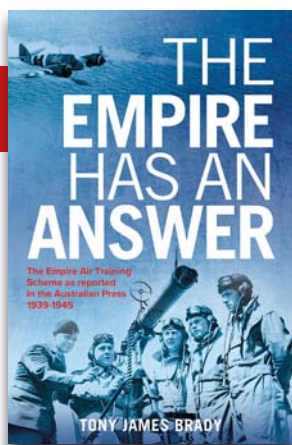
I do not wish to end this review on a negative note, however. The book's weaknesses are born of sins of omission rather than commission. There is much of value to be found here, and its strengths are in the chapters describing the 1940s and 1950s. The author might have been best encouraged to write a fourth volume covering the latter period in more detail.

PROFESSOR KEITH HAYWARD FRAeS

The Empire Has An Answer: The Empire Air Training Scheme as reported in the Australian Press, 1939–1945

By Tony James Brady; Big Sky Publishing, Newport, PO Box 303, Newport, New South Wales, Australia; 6¼in x 8½in (160mm x 216mm); softback; 340 pages, illustrated; AUD\$34.99. ISBN 978-1-922265-36-4

IN HIS BOOK *Britain's War Machine*, historian



David Edgerton convincingly argues that Britain entered the war in Europe in 1939 fully anticipating victory. Rather than defending a beleaguered island, he contends, Britain counted on marshalling the bellicose resources of a global empire. Reflecting entrenched RAF doctrine, offensive aerial operations constituted its primary European ambit during 1941-44.

Airmen comprised Australia's primary contribution to this campaign. Propelling their service was the Empire Air Training Scheme (EATS), which graduated some 37,576 Australian aircrew for imperial and local squadrons during 1940-45, plus thousands more non-flying personnel. Acknowledging its unprecedented scale, this book explores how EATS was depicted in Australia throughout the conflict.

"Depicted" is the critical term. Collating 35,000 wartime newspaper accounts, author Tony James Brady assiduously analyses what was reported about EATS to the Australian populace. This approach enlivens the political machinations and logistical grind of sculpting a vast training organisation from next to naught. Numerous published letters and press cameos personalise the rigours of instruction in flying, navigation, bombing and aerial gunnery, as well as operational conversion.

The author captures well the functions and flow of the scheme, including its victories and casualties. A lengthy penultimate chapter also includes potted anecdotes from many squadrons manned by EATS alumni. Especially saddening were pervasive press reports of Australians serving overseas who received white feathers for not returning to defend their nation against the Japanese threat after December 1941.

The author, however, makes little allowance for the selective and (self-) censored character of wartime reportage. Few archival documents are cited, while the bibliography of books and academic articles spans just three pages. Factual errors such as V1 "rockets" and Big Sky's consistently erratic editing also niggle.

Nevertheless, *The Empire Has an Answer* delivers exactly what its subtitle promises, offering a fresh and very readable account of a significant contribution to Allied airpower.

Dr PETER HOBBS

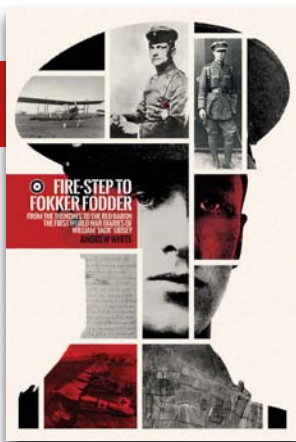
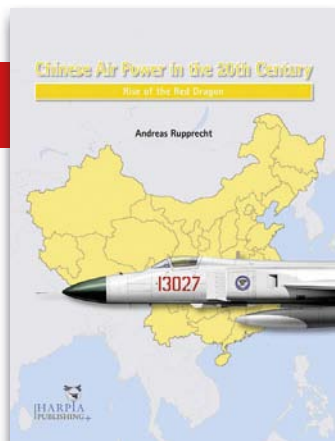
Camel Pilot Supreme: Captain D.V. Armstrong DFC

By Annette Carson; Pen & Sword, 47 Church Street, Barnsley, South Yorkshire S70 2AS; 6½in x 9½in (160mm x 236mm); hardback; 272 pages; illustrated; £25. ISBN 978-1-526752-67-3

SOME READERS MIGHT recognise the author of this book as the one responsible for *Flight Fantastic*, an excellent history of aerobatics published in 1986. As such, she was well suited to turn her spotlight on South African Capt D'Urban Victor Armstrong, described by the late Jack Bruce as the exponent of "the most extraordinary and outstanding aerobatic flying ever done anywhere in the world" during the First World War, and also as "a nightfighter pilot of considerable distinction".

Armstrong's masterly low-level aerobatic demonstrations of the notoriously tricky Sopwith F.1 Camel fighter earned him great admiration from his fellow pilots in that conflict, to such an extent that his name has subsequently become almost legendary. A tribute such as this has been long overdue, and it is a pleasure to report that it does him full justice.

Carson traces Armstrong's life from his family origins, through his education and his military service in South Africa, to his enlistment in the Royal Flying Corps in 1915. Following his training, Armstrong served in Nos 22 and 45 Sqns, and then in No 60 Sqn, flying Moranes and Nieuports. By early 1917 he was ferrying and flight-testing in the UK, encountering a variety of aircraft types until he moved on to Home



Defence units, where he first began flying Camels against German night bombers.

Tragically, Armstrong was killed in a flying accident two days after the Armistice, during one of his frequent and outstanding aerobatic displays. Although the casualty report attributed the tragedy to an “error in judgment”, the author has undertaken a lengthy investigation into the circumstances, and presents her findings and conclusions in a convincing manner. The only thing that goes a bit too far is the two-page imaginative script of Armstrong’s thinking during that tragic last flight; an indulgence that might have been better omitted.

An impressive gallery of black-and-white and colour images, many from Armstrong’s own album, and some dramatic paintings by Lynn Williams, round off this impressive work.

PHILIP JARRETT

Chinese Air Power in the 20th Century: Rise of the Red Dragon

By Andreas Rupprecht; Harpia Publishing, Meynertgasse 8/8, 1090 Vienna, Austria; 8½ x 11in (216mm x 280mm); softback; 253 pages, illustrated; €38.95 excl p&p. ISBN 978-1-950394-00-5

IF, LIKE THIS reviewer, your knowledge and understanding of the history and development of Chinese military aviation during the 20th Century is somewhat sketchy to say the least, this comprehensive tome from Harpia will be a very welcome addition to your bookshelf.

Written by Andreas Rupprecht, whose previous series of books for Harpia over the last decade on Chinese airpower has set the standard for coverage of the subject, this substantial softback, subtitled “Rise of the Red Dragon”, tackles the often mind-bendingly complex evolution of Chinese combat aviation

(transports are not covered here) with aplomb.

The task of trying to make sense of such a sprawling and intricately layered political and geographical history is made all the harder for Western readers by the sheer difficulty of trying to differentiate between the various characters, all of whom have names that are something of a struggle to retain for those of us more accustomed to “Smith”. This aspect is not helped by the sometimes garbled English, which, given the sheer complexity of the subject, could have used another edit, but the author does well to set the story of aviation in China alongside the nation’s notoriously tangled political history.

Illustrated with numerous extremely rare photographs (some of which are used disappointingly small in the early chapters — some are literally thumbnails — presumably finding images of high enough resolution was something of a challenge), the book is divided into six chapters. These run chronologically from the fall of the Qing Dynasty in 1911 through to the final section detailing the nation’s aviation modernisation period from 1976 to the present. There are also three good appendices, including a history of the final seven regional air forces, an explanation of China’s air divisions, and details of the People’s Liberation Army Air Force’s serial number system — all invaluable and hard-to-find stuff. There are also numerous helpful maps by James Lawrence and a useful index.

The small niggles above notwithstanding, this is a valuable and important piece of work, and if you buy one book on this little-covered (for good reason) but fascinating subject, make it this one.

NICK STROUD

Fire-step to Fokker Fodder: From the Trenches to the Red Baron — the First World War Diaries of William “Jack” Lidsey

By Andrew White; Fighting High Publishing, available via

FAST ASSOCIATION TALKS

Farnborough Air Sciences Trust Association (FASTA); annual membership £25; The Membership Secretary, FASTA, Trenchard House, 85 Farnborough Road, Farnborough GU14 6TF; website www.airsciences.org.uk/association.html

FASTA, THE SUPPORT group for Farnborough's excellent FAST Museum, which charts the history of the Royal Aircraft Establishment (RAE), has been running regular thrice-yearly lectures for a long time — and in late 2018 *The Aviation Historian* came on board as co-sponsors of these events. The talks, which are free to FASTA members (non-members also welcome, for a £5 donation), are held at The Village Hotel in Farnborough on specified Tuesday evenings, and encompass a wide variety of broadly RAE-related topics. The most recent one, in February 2020, featured Prof Guy Gratton on atmospheric-research flying in the UK; upcoming are Peter Reese on *Triumphs and Tears: British Aviation 1945–1975* on June 2, and Paul Beaver on *Spitfire People: A Few Facts about Supporting The Few* on September 22. Previous talks have included *TAH* Editorial Board member Philip Jarrett on the Royal Aircraft Factory's first fighter aircraft designs; *TAH* author Chris Pocock on 60 years of the Lockheed U-2; Doug Bateman on the RAE's role in the development of freefall nuclear weapons; and Peter Coombs on a century of air accident investigation. The talks typically attract upwards of 200 attendees, so *TAH* readers can be sure of finding themselves in like-minded company. **MO**

www.casematepublishing.co.uk; 6in x 9¼in (156mm x 236mm); hardback; 208 pages; illustrated; £19.95. ISBN 978-1-999812-87-4

SECOND LIEUTENANT William John “Jack” Lidsey and his pilot, Flt Sgt Sidney Quicke, became the 29th victims of Manfred von Richthofen on March 22, 1917. Author Andrew White, an established historian and former RAF officer, went to the same school as Jack Lidsey — Magdalen College School in Brackley, Oxfordshire — and noticed Jack's memorial cross while still there. Many years later he found that Jack had kept a diary, and with the blessing of the family he has been able to write an account of his short life — he was 21 when he died. The career history of many First World War flyers involved service in the trenches, followed by a successful application to the RFC as an observer as a prelude to pilot training, usually being commissioned at some point. These men brought a wealth of military experience to the RFC compared with those who joined straight from civilian life, and often went on to have successful careers. But of course it could all be cut short at a moment's notice, often by bad luck rather than lack of skill.

Jack Lidsey enlisted in the Oxfordshire and Buckinghamshire Light Infantry as soon as war broke out, and this unit was in France by April 1, 1915, in time for the second battle of Ypres. Jack does not seem to have stood out at school, academically or at sports, but was promoted to Lance Corporal later that month, so he must have had qualities noted by his superiors. His diary, like many others, is rather matter-of-fact and does not dwell on the horrors of war. But its understatement speaks volumes, such as the “beastly smell of dead bodies” and “four hours standing nearly waist-deep in mud and water. Was absolutely fed up and felt jolly rotten”. Temperatures in the trenches sometimes dropped to -10°C at night in the winter.

Lidsey served on the Western Front, including

during the Battle of the Somme, until November 1916, apart from three months of Officer Training. He survived fighting, unscathed, that killed many of his comrades. He was then accepted as an observer with the RFC. Observer training was then even less formalised than pilot training, and all but a couple of weeks were “on the job”. He was posted to No 16 Sqn, which was still flying B.E.2cs. In the book's title, the publishers have opted to pursue the cliché of the B.E.2c being “Fokker Fodder”; while this is not entirely unjustified, the casualty rate of B.E.2cs in the first half of the war was little higher than any other two-seater and probably less than some. The term “Fokker Fodder” was coined by a particularly histrionic MP, whom the author admits had a financial interest in criticising the Royal Aircraft Factory.

The introduction to the book is written by a retired Lieutenant-General who describes the B.E.2c as a “kite powered by a lawnmower engine”. This is sloppy at best; I would like to see a lawnmower powered by a 90 h.p. V8 engine! Admittedly, Jack was unlucky to be posted to one of the few squadrons still flying B.E.2 variants in the spring of 1917. He was aware of its deficiencies, and was looking forward to the squadron getting new types; in truth his life expectancy would have been little better if he had been flying the replacement R.E.8. As it was, he was killed in B.E.2f A3154 during preparations for the Battle of Arras.

This book is well worth reading for its insight into the life of an ordinary soldier and airman; the background to the diary is competently fleshed out. Maps are provided at the back, although the newly drawn sketches are more useful than the reproduced First World War-vintage maps. Only the last third of the book is about flying, but most readers should find the rest interesting, even those who normally only ever read about aviation.

ADRIAN ROBERTS



BOOKS IN BRIEF

A quick round-up of what else is currently available for the aviation history enthusiast

AIR WARS BETWEEN ECUADOR AND PERU VOLUME 1: THE JULY 1941 WAR

Amaru Tincopa

Helion & Co; ISBN 978-1-911628-67-5; £16.95

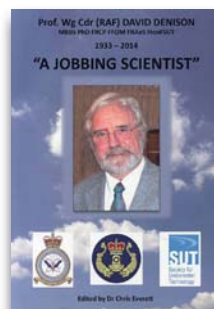
COVERED TO SOME extent by the same author in this issue (see pages 54–66), the first of three significant 20th Century border conflicts between South American neighbours Peru and Ecuador is the subject of the 12th volume in Helion's consistently dependable *Latin America @ War* series. Well up to the usual standard, this provides excellent background to the *Guerra del 41*, and offers a balanced and fair-handed appraisal of both sides in this brief but technologically significant war. Includes numerous rare photographs, useful maps and 21 artworks by Luc Canossa. Highly recommended. **NS**



"A JOBBING SCIENTIST" Prof Wg Cdr David Denison — Edited by Dr Chris Everett

Farnborough Air Sciences Trust;
no ISBN; £20

THIS EXTRAORDINARY 8½in x 11¼in 91-page softback, published and available only through the Farnborough Air Sciences Trust, was dictated to Dr Chris Everett by the late David Denison, one of those remarkably dedicated and endlessly curious-minded scientists at the Institute of Aviation Medicine who took hair-raising risks with their own safety to further the knowledge of the physiological aspects of flying. Denison is a fascinating study; a free-thinking iconoclast, he was completely fearless in his pursuit of vital information. The chapter on his work on oxygen-rich atmospheres, and the sad fact that NASA ignored it, is utterly compelling. **NS**

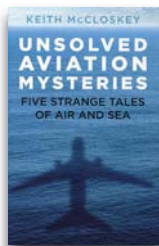


UNSOLVED AVIATION MYSTERIES: FIVE STRANGE TALES OF AIR AND SEA

Keith McCloskey

The History Press; ISBN 978-0-750992-58-9; £11.99

INVESTIGATING FIVE incidents in which aircraft have come to grief in mysterious circumstances while overflying the sea, this enjoyable 5in x 7¼in 223-page paperback takes an impressively detailed look at the bizarre disappearance of Cessna 150 G-AVTN on the Isle of Mull in December 1975 ('twas a dark and stormy night etc); the light-aircraft crash that killed John F. Kennedy Jr in July 1999; the 1953 Kinross Incident (F-89 vs UFO?); the loss of a Sri Lankan businessman in his Learjet in February 1983, and the still-puzzling 1928 Alfred Loewenstein case, in which the Belgian millionaire simply vanished from the cabin of his Fokker trimotor over the English Channel. Wisely, the author offers no definitive answers, but sticks to his well-researched — and thoroughly entertaining — facts. **NS**



X-PLANES No 13: THE WRIGHT FLYERS 1899–1916

Richard P. Hallion

Osprey Publishing; ISBN
978-1-472837-77-6; £13.99

THE LATEST IN Osprey's attractive *X-Planes* series details, appropriately enough, the very first machine to be able to claim that sobriquet. Telling this "ground zero" story is highly respected aviation historian (and *TAH* Editorial Board member, it should be added) Dr Richard P. Hallion — and there really is nobody better equipped to tell it. Covering all the Flyers (and other models) built by Orville and Wilbur Wright and their company up to Orville's sale of the latter in 1915, after his brother's death in 1912, this is a superb primer for those wanting a concise, readable, "aviation origin of species" packed with solid info. **NS**



STRATEGIC AIR COMMAND IN THE UK: SAC OPERATIONS 1946–1992

Robert S. Hopkins III

Hikoki Publications; ISBN
9-781902-10956; £29.95

FORMER SAC pilot Hopkins's writing will be familiar to *TAH* readers from his articles about Gen Curtis LeMay's personal Boeing KC-135 and the earliest B-47 Stratojet deployments to the UK. This finely-produced hardback, illustrated with many previously unseen images, provides a fully-rounded picture encompassing much more than just SAC's high-profile ops with B-47s, SR-71s and KC-135 tankers. **MO**



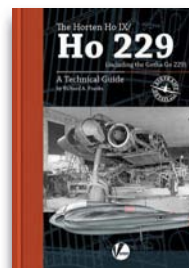
AIRFRAME DETAIL No 8: THE HORTEN Ho IX/Ho 229: A TECHNICAL GUIDE

Richard A. Franks

Valiant Wings Publishing; ISBN
978-1-912932-10-8; £13.95

ENDLESSLY FASCINATING, the unorthodox German aircraft of the World War Two period don't come much less orthodox than the Horten family of tailless types.

This monograph on the Ho 229 twin-jet fighter-bomber, which never made it into quantity production, features plenty of detail photographs of various prototypes under construction, plus colour images of the V3 (now preserved in the National Air and Space Museum's Udvar-Hazy Center in Virginia, USA), diagrams, colour artworks and a kit-build. **MO**

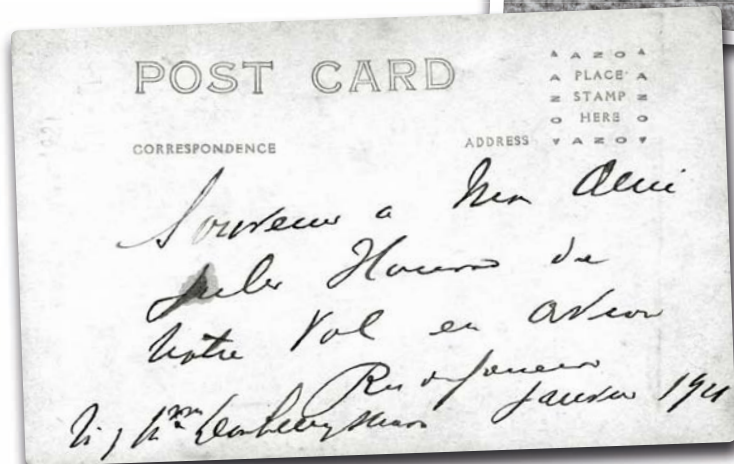


Lost & Found

PHILIP JARRETT explores the lesser-known corners of aviation history, discovering little-known images and rediscovering long-lost details of aircraft, people and events. This time he is intrigued by a postcard depicting an unusual joyrider in an unusual location

I PURCHASED THE vintage postcard depicted here from France because it intrigued me. In the first place, it took a little time to confirm the identity of the aeroplane; a Paul Schmitt Type 3 two-seater, which entered service with the *Aviation Militaire* of France in 1915. It is estimated that only six were built, probably having the military serials P.S.3 to P.S.8, and that, although they were intended to serve as bombers, they served only in training units. The Type 3 was powered by either a 150 h.p. Canton-Unné or a 160 h.p. Gnome.

What is really intriguing, however, is the French inscription on the back of the card. It is not totally legible, but translated into English, it says, in part: “Souvenir of Mm Alice [?] Jules H???? of your flight in aeroplane. Rio de Janeiro, January 1921”. The name at bottom left is indecipherable. A close look at the two passengers squeezed into the front cockpit reveals that the one on the left is indeed a woman, and both have been provided with the old Roold-type safety helmets. The question is: if this picture was indeed taken in Brazil, how did an obscure aircraft like the Paul Schmitt Type 3 end up serving as a joyride provider so far from France?



ABOVE *The pair of joyriders ensconced in the front seat of a Paul Schmitt Type 3, possibly in Rio de Janeiro, in 1921, duly indicated with ink crosses drawn on the postcard. The identities of the other people in the photograph are also unknown.*

LEFT *The inscription on the reverse of the postcard. Do any readers have any more info on this rare bird, seemingly in an exotic location far from home? Contact the Editor, whose details are on page 3, if so. We'd love to hear from you!*



+ BRIEF ENCOUNTER +

MY SHORT-LIVED LOVE AFFAIR WITH 'DELECTABLE DORIS'

In August 1989, having spent a week getting to grips with some vintage heavy metal in the UK for the making of the film *Memphis Belle*, **BRIAN TURPIN** — then flying corporate bizjets for a living — was given the opportunity of a lifetime by warbird collector David Tallichet, not only to cross the Atlantic in a B-17, but also add the magnificent Liberator to his logbook



IN THE SUMMER of 1989 I found myself rather unexpectedly sitting in the right-hand seat of David Tallichet's Boeing B-17G, N3703G, acting as copilot during the last week of the making of the film *Memphis Belle* at RAF Binbrook in Lincolnshire. This was a far cry from my normal duties, flying company personnel around Europe in rather more modern executive aircraft. Things got even more exciting at the end of the week, when we left Binbrook to fly the aircraft back across the Atlantic to Buffalo, New York, via Prestwick, Reykjavik (Iceland), Narsarsuaq (Greenland) and Goose Bay (Labrador). Spread over three days, the total flight time was 27hr, with the 45-year-old aircraft, remarkably, presenting us with no mechanical problems along the way.

Having just completed one of the most exciting weeks of my flying career, things got even more thrilling the day after our arrival in Buffalo when we boarded a Northwest Airlines Boeing 727 and flew via Detroit to Grand Rapids, Michigan. There, waiting for us on the apron in all her glory, stood *Delectable Doris*, David's magnificent Consolidated Liberator. It was love at first sight.

MEET DORIS

This particular B-24 was built by Consolidated at Fort Worth, Texas, and delivered in 1944 to RAF South East Asia Command as a Liberator B Mk VI, serial KH401. With the ending of the war in the Pacific, it was one of 36 Liberators acquired by the Indian Air Force, and was used by No 6 Sqn IAF as HE771/"P" until retired in December 1968. Placed in open storage at Poona, the Liberator was purchased in 1973 by David Tallichet to join his growing collection of warbirds based at Chino, California.

The aircraft was flown from India to the UK in October of that year, arriving at Duxford on the 28th. There it remained over the winter while necessary maintenance work was completed before it could be flown across the Atlantic. Volunteer members of the "Friends of the Eighth" organisation undertook the work, the repairs including replacing No 3 engine. In return for the work done, David gave the volunteers the freedom to paint the aircraft in the colours and nose art of their choosing. Selecting just one to pay fitting tribute to a Second Air Division (2AD) bomber group of the Eighth Air Force was difficult, but, after consulting with 2AD veterans, the volunteers decided to go with the 389th Bomb Group's *Delectable Doris*, with its original serial number, 42-50551, 566th Bomb



WHO WAS THE REAL DELECTABLE DORIS?

THE REAL *Delectable Doris* was Ford-built B-24J serial 42-50551, based at Hethel in Norfolk. It was named by Capt William C. Graff of the 566th Bomb Squadron in honour of his fiancée, Doris Falconer of London. As she pointed out later, she did not pose for the rather racy nose art; it was in fact based on a Vargas pin-up girl of the time. The Liberator was shot down during a raid on Magdeburg, Germany, on February 3, 1945, by which time Graff was no longer part of the crew. The debrief notes state that the aircraft was hit by flak over the target, the initial hit taking off the nose. The aircraft disintegrated at 17,000ft (5,200m) on fire, with the controls shot out and the bombload still aboard. Two of the crew survived as prisoners of war: copilot John "Jack" Merrill and starboard waist-gunner Billy Weidman.

On June 1, 1975, at Duxford, the original Doris and her husband William Graff approved the newly applied reconstruction of the original nose art and christened David Tallichet's B-24 (as seen ABOVE). The occasion was the 28th Reunion of the Second Air Division Association, held in Norwich during May 30–June 14 that year. **BT**

Squadron code letters RR and radio callsign R+. Work on the aircraft took longer than expected and was only fully completed by the time the Second Air Division Association held a reunion at Norwich and Duxford in the summer of 1975. On August 27, 1975, *Delectable Doris* left Duxford on the first leg to America, but on landing at Prestwick the nosewheel collapsed. Repairs took some time to complete and it was

OPPOSITE PAGE, TOP Consolidated Liberator *Delectable Doris* in a gin-clear sky while operating as part of David Tallichet's Military Aircraft Restoration Corp during 1980–94. **OPPOSITE PAGE, BOTTOM** The author poses for a photograph with his new paramour, *Delectable Doris*, at Grand Rapids, Michigan, on August 10, 1989. VIA AUTHOR x 2

David Tallichet gives a little TLC to Doris's No 2 Pratt & Whitney Twin Wasp engine at Grand Rapids. Built by Consolidated at Fort Worth, Texas, this Liberator saw service with the RAF as KH401, as which it served with No 357 Sqn in northern India on long-range sorties as far afield as Malaya and Sumatra. It later served with No 232 Sqn at Poona in central western India until it was struck off RAF charge on September 20, 1946.



RIGHT The Vargas-style artwork of "Delectable Doris" painted on the port side of the Liberator's front fuselage. The original Delectable Doris, of the 566th BS, 389th BG, was lost on an Eighth Air Force raid on February 3, 1945, when more than 1,200 B-17s and B-24s bombed marshalling yards in Berlin and a synthetic oil plant at Magdeburg in central Germany.



BELOW With a cough and a puff of smoke, No 3 engine is started at Grand Rapids. Note the nose artwork is on the port side only. After leaving RAF service, this machine served with the Indian Air Force, which acquired a number of examples refurbished by Indian company HAL after they had been appropriated from abandoned RAF stocks in India.





ABOVE The “office” of the Liberator, with basic flying instruments ranged to the left for the pilot and the engine controls to the right for the copilot, including the two paired manifold pressure gauges inside a red-taped box, below which are the r.p.m. gauges in a white box, to the right of which are the oil pressure gauges in a yellow box.

not until September 11 that she left Prestwick to continue her journey home, landing at Rentscher Field in East Hartford, Connecticut, on the 15th.

When the aircraft finally arrived at Chino, it was fully restored by Tallichet’s Military Aircraft Restoration Corp, registered with the FAA as N94459 and spent the next few years touring the airshow circuit around America and on loan to various air museums.

And now here she was on that hot August day, waiting patiently for a little care and attention before we could coax her once again into the air.

TO BUFFALO

The plan was, after replacing the turbo-supercharger on No 3 engine and some other general maintenance work, to fly the aircraft from Grand Rapids to Buffalo, where a Veterans’ Day had been arranged for the following weekend. Our crew of four was the same as had flown the B-17 from England: David Tallichet as captain, me as copilot and my fellow Brits Clive Denney and Dick Hladick as engineers. Clive was one of the founders of Historic Flying Ltd at Audley End, while Dick came from Suffolk Aero Services and had flown in the Liberator when it had been collected from India.

On the second day at Grand Rapids, once the maintenance work was completed and we had undertaken engine runs, David showed me round the cockpit and discussed operational

procedures. We were beginning to run out of time, so after a quick lunch we filed a flight plan, visual flight rules (VFR) direct to Buffalo, checked the weather and prepared to get going.

Starting the big Pratt & Whitney R-1830 Twin Wasp engines was straightforward: propellers set to high r.p.m.; throttles $\frac{1}{2}$ open; ignition all ON and booster pump ON for the engine being started. While priming, the starter was energised and then meshed, and as the engine fired up the mixture was set to AUTO LEAN. The start sequence using internal power was 3, 4, 2, 1, as the engine-driven hydraulic pump was on No 3 engine. With external power the normal 1, 2, 3, 4, sequence could be used. All four engines started without any problems and with 1,400 r.p.m. set and all gauges reading normally we were ready to go. Air traffic control (ATC) gave us taxi clearance to runway 26L, a longish ride to the other side of the airport, which gave time for the engines to reach their optimum operating temperatures.

Taxying a Liberator is straightforward, using as little brake as possible with rudder held neutral and using the outboard engines to steer. There is no direct nosewheel steering. On hard surfaces 700–800 r.p.m. produces a fast walking pace, but the throttles are spring-loaded to give more power than this and have to be held back while taxiing, otherwise the speed becomes excessive.

Once at the holding point the engines were run

No 2 engine undergoes a running test before the flight to Buffalo — it was a very different experience from the author's regular day job, flying corporate jets around Europe for the Ford Motor Company, although his experience on flying the Douglas DC-3 for Skyways Coach-Air stood him in good stead — see Out on a Lympe (TAH17).



up in turn to check the magnetos and propeller controls, and to set the automatic electronic turbocharger regulator. The pre-take-off checks were completed, with mixtures set to AUTO RICH; booster pumps all ON; flaps set to 20°; cowl flaps 1/3 open and generators all ON.

GETTING DORIS AIRBORNE

We called ready for departure and ATC cleared us to line up and take off. David taxied on to the runway and slowly opened the throttles. The Liberator was held on the brakes until the manifold pressure reached 25in Hg. This allowed the turbo regulator to stabilise, giving a smooth flow of power from all engines. With brakes released, we surged forward and it was now my job to hold the throttles fully open and to ensure that the automatics did not allow the manifold pressures to exceed the maximum permitted.

As the airspeed increased, David applied slight back-pressure on the control column to take some of the weight off the nosewheel, and, once past the minimum safe speed (at our weight) of 110 m.p.h. (177km/h), the aircraft flew itself off the ground. Holding the aircraft low while we accelerated to 130 m.p.h. (209km/h), David called for "gear up". The undercarriage responded as it should, except for the starboard mainwheel which failed to retract completely into the wing. Hydraulic pressure kept it where it was so we left it alone for the rest of the flight.

With the post-take-off checks completed, the flaps were then raised as we turned east on course for Buffalo, and the speed allowed to increase to the best climb speed of 150 m.p.h. (240km/h), with 2,550 r.p.m. and 41in Hg boost-pressure set.

On reaching about 5,000ft (1,500m) we levelled

off for the cruise and David reminded me of the old "on-the-step" technique I had last used when flying DC-3s several decades previously. The idea was developed to overcome a problem with large, draggy aeroplanes. If you level off exactly at your cruise altitude and then reduce power, the aeroplane will never reach its best cruising speed and will fly slightly tail-down, creating a lot of unnecessary drag. To avoid this, the technique involved climbing to about 500ft (150m) above the required cruising level and then descending slowly to the correct level before reducing to cruise power. The aircraft would then sit nicely "on the step" with a much-improved cruise performance. Of course, going above your assigned level these days ATC would probably consider to be an "altitude-bust".

We were now settled in the cruise, 1,900 r.p.m. and 28in Hg manifold pressure giving us an indicated airspeed of 160 m.p.h. (258km/h). At this point David handed over to me and I got a feel of the aircraft for the first time. According to the official Flight Manual, the handling is conventional and normal. Stability is described as excellent and high manoeuvrability is possible. Well, that may be so, but the controls are very heavy and I found it very difficult to make it fly in a straight line. If left to its own devices the aircraft was constantly yawing about a central line, which required constant attention if anything like straight-and-level flight was to be maintained. So flying for the next three hours was a constant battle, requiring considerable manual effort to achieve the desired result.

I needn't have bothered. At dinner that evening I discussed the Liberator's handling characteristics with one of the veteran pilots there, who had flown many combat missions in



LEFT *The author (left) at the controls of the Liberator during the Grand Rapids—Buffalo flight, with David Tallichet in the right-hand seat.*

BELOW *It was hoped that Delectable Doris would return to Britain to commemorate the 50th anniversary of the first arrival of USAAF wartime units in the UK in 1992. The author canvassed support from Ford, which built numerous examples of the bomber, but it came to naught. In late 1994 Tallichet sold Doris to Kermit Weeks in Florida.*

the type, and he confirmed that this was normal behaviour and that pilots just let the aircraft get on with it, although this had to be kept under some control when flying in close formation and on the run-up to the target. It was all to do with the prop-wash over the fins and tailplane. Later, when Consolidated produced the PB4Y-2 Privateer version, with a single fin and rudder, the problem disappeared.

THREE GREENS

Our flight path took us close to the southern tip of Lake Huron, past London, Ontario, and then along the north shore of Lake Erie to Buffalo. The weather generally was good throughout the 300-mile (480km) flight, but with a few diversions to avoid thunderstorms and heavy showers.

Dusk was rapidly approaching as we made contact with Buffalo ATC and David took over again for the approach and landing. Pre-landing checks completed, we joined long final for Runway 05 and reduced below the flap-limiting speed of 140 m.p.h. (225km/h). We then selected the undercarriage down and were pleased to see all three legs lock down with “three greens”. Half flap was extended and the final approach

flown at 120 m.p.h. (195km/h), slowing to 110 m.p.h. once full flap had been lowered.

Crossing the threshold, the throttles were closed and David held off while the Liberator decelerated and touched down on the mainwheels, with the nosewheel held clear of the runway until it naturally dropped as the aircraft slowed down and the elevators became decreasingly effective.

After clearing the runway, I performed the post-landing checks and raised the flaps while David manoeuvred the aircraft on to the apron to its prime parking position among a collection of Second World War-vintage aircraft that had been flown in for the occasion.

Sadly, that was the end of this adventure as far as I was concerned. I had to be back to the day job on Monday morning. So, the following day, after saying goodbye to David and Clive, Dick and I boarded a Continental Airlines MD-80 to fly to Newark, and from there by Virgin 747 to Gatwick, where we arrived early on Sunday morning. My brief encounter with *Delectable Doris* was at an end and the following morning I was in the left-hand seat of a BAC One-Eleven on a round-trip to Cologne.



The perfect place to order “wings to go” — Douglas C-47A c/n 18923 (formerly 42-100460, VH-ANM, ZK-CAW and VQ-FAI) was converted into a McDonald's restaurant in Taupo on New Zealand's North Island in November 1990 and remains a major tourist attraction today — it was photographed by the author in May 2014.



OFF THE BEATEN TRACK

*Ever turned a corner to find something unexpected? The Aviation Historian's intrepid aeronautical explorer **PETER DAVISON** investigates the stories behind the oddities that turn up in the most unusual places . . .*


NEW ZEALAND'S North Island is not blessed with many major highways, despite having the nation's most populous urban area in Auckland. Driving 170 miles (275km) south from the latter, the lakeside town of Taupo is hard to miss.

An aviation nugget to be found in Taupo town centre is Douglas DC-3 c/n 18923, which has been converted into a McDonald's franchise, complete with dining tables; it's enough to give you the shakes.

Built as a C-47A-65-DL at Long Beach, California, the aircraft was delivered to the USAAF as 42-100460 in October 1943, making its way to Brisbane, Queensland, to serve with the US Fifth Air Force two months later. In December 1945 it was sold to Australian National Airways and joined the fleet as VH-ANM in early 1947. After further moves to Queensland Airlines, ANSETT-ANA and Airlines of New South Wales, it crossed the Tasman Sea to become ZK-CAW with South Pacific Airlines of New Zealand in 1961, later serving with New Zealand National Airways Corporation and Fiji Airways (as VQ-FAI) in the 1960s.



PHOTOGRAPHS BY THE AUTHOR

In May 1971 it was sold to Fieldair Holdings for use as a top-dressing aircraft, before being withdrawn from use in October 1984. In 1985 Taupo Mayor Rick Cooper bought the machine during a stopover in New Plymouth, with a view to using it as an office, but McDonald's asked if it could be used at an intended restaurant — and it has since earned the plaudit of heading the list of “the world's coolest top ten McDonald's”. 



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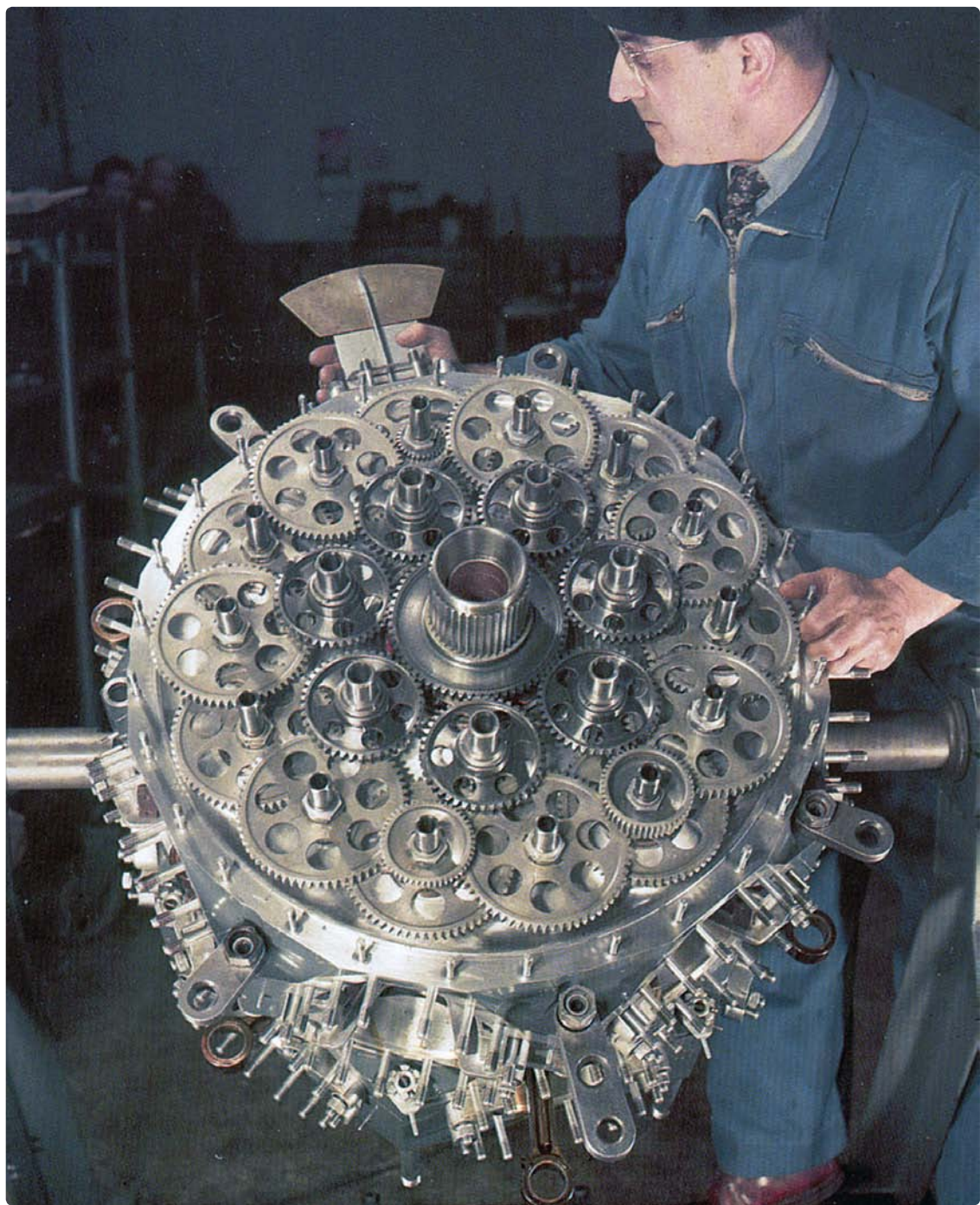
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